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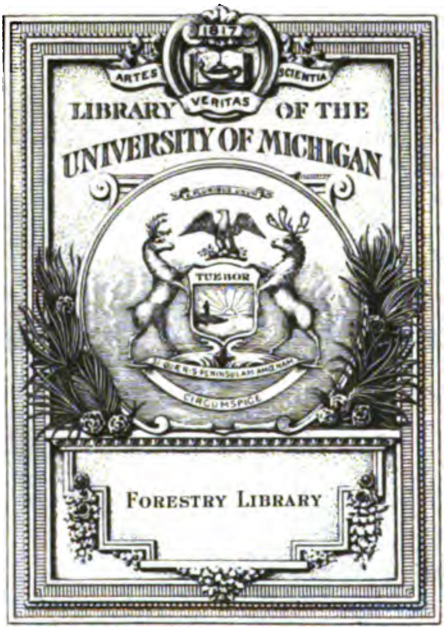

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THE

AMERICAN

JOURNAL OF FORESTRY

DEVOTED TO THE INTERESTS OF

FOREST TREE PLANTING, THE FORMATION AND CARE
OF WOODLANDS, AND ORNAMENTAL PLANTING
GENERALLY, AND TO THE VARIOUS ECON-
OMIES THEREIN CONCERNED

EDITED BY

FRANKLIN B. HOUGH, PH.D

First Chief of Forestry Division, Department of Agriculture, Member of the
American Philosophical Society, etc

Oct

SEPTEMBER, 1882—OCTOBER, 1883

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THE AMERICAN JOURNAL OF FORESTRY.

OCTOBER, 1882.

ANNOUNCEMENT.

IN appearing before the public with a new journal, it may be expected that its editor should announce the plan upon which it will be conducted, and the objects that he hopes to accomplish through its publication. Although the subject was announced as one under consideration at the meeting that resulted in the organization of the American Forestry Congress, at Cincinnati, in April last, it had long before been mentioned as one deserving of attention, as an agency for advancing the interests of Forestry, and for the discussion of questions that must arise, as this subject, already of growing importance, began to claim a greater share of public attention as a matter of scientific inquiry, and of practical work.

In a paper read by the editor of this journal, at a meeting called to complete the organization of the American Forestry Association, held at the Judges' Hall upon the grounds of the Centennial Exhibition at Philadelphia, on the 15th of September, 1876, and published in full on the 15th of October of that year, in the *Lowville Times*, the following language is found:

> " . . . I have one other suggestion in behalf of Forestry, which may be premature, but which, notwithstanding, I will lay before you for consideration. It is one upon which I have bestowed much thought, and on which I have made estimates. It comes within the line of labor for concentration of effort, in which, on

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every subject, Americans feel most at home, and through which they have achieved the greatest success.

"I refer to the establishment of a *Journal of Forestry*, which should be wholly devoted to the advancement of this measure, upon every scientific and practical point that comes within its province, and wholly free from the bias of interest in affairs of trade. In short, a journal that shall do for Forestry what the *American Journal of Science and Art* has done for the Sciences generally in our country, and which this and other and more special journals are now doing for the interests they have in charge.

"It is true that our public journals are very generally willing to publish articles, and to diffuse information upon this subject, and that some of them have taken special care to do so. We have also many excellent journals devoted to Agriculture, Horticulture, Pomology, and the like, as well as those especially devoted to the lumbering and tanning interests. But these touch but incidentally upon Forestry as a science, and are usually most concerned in practical questions relating to their particular subjects—the quotations of the markets, and other questions upon which their business depends. In short, our current literature upon Forestry is so scattered that the most active and diligent person could scarcely hope to gather all that is passing upon the subject, with the largest facilities that any-where exist, while to the general reader they come but occasionally under notice, and quickly pass beyond his reach for reference. Moreover, there is no existing journal in our language * that undertakes to digest and present the results of researches going on among scientific foresters upon the Continent of Europe—and we surely get now and then a glimpse of what might be fully and promptly presented, with the greatest advantage.

"The time will surely come when such an enterprise will be demanded, and will be sustained, although perhaps not now. Meanwhile, it is within the power of every man to do something towards advancing the interests of Forestry, either by himself planting trees, as circumstances favor, or by aiding in the formation of a public sentiment, tending to encourage planting for future use."

The ideas thus expressed eight years ago have gained in weight from the events that have since happened. The waste of our native forests has been going on without restraint, excepting as one region after another has been exhausted of its supplies—and advancing prices admonish us of still greater scarcity in materials of forest growth. These facts have begun to awaken attention, as well in regions once thought to afford "inexhaustible supplies," as in those where the native scarcity or entire absence of forests were the first facts noticed at the time of first settlement. The necessity of observing strict economy in the use of what remains of the native growth, and the importance of planting for future uses will now scarcely be denied by any one who has given attention to this subject. It will be our special effort to collect and diffuse information upon every point that has a direct or incidental bearing upon these questions of economy in use, and of profitable result in the way of restoration. We shall seek to gather from careful observers the results of their experience, and from the researches of specialists the fruits of their labors, in whatever may tend to the advancement of American Forestry, in its most general sense, and shall endeavor to present them in a way that shall be most practical and useful, under the conditions, as we find them in Canada and the United States. We mention these countries in connection, because, although distinct in government, they have a common interest in all questions of Forestry. The productions of each seek a market in the other; in soil and climate and native forests they have a strong resemblance; in present and future wants, as to the growth and use of forest products, they have a common interest, and whatever influence may in this affect one country, will always be felt in both.

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* *The Journal of Forestry and Estates Management* (London), was commenced May, 1877, more than half a year after this paper was written.

While our pages will be open for the discussion of all questions that come within our proper field of inquiry, we must leave with their authors the responsibility for any facts or opinions they may present, and nothing will be admitted that has the suspicion of being written to advance a private interest for a personal end.

We shall seek to secure exchanges with special journals devoted to Forestry and related subjects, throughout the world, and shall endeavor to glean from these and from special and official publications whatever may appear of *practical utility*, whether it relates to new principles in science, improved methods of management, or economy of results.

FRANKLIN B. HOUGH.

FORESTRY IN MICHIGAN—OUTLOOK AND SUGGESTIONS.

By Professor V. M. SPALDING, Ann Arbor, Mich.

IT is not necessary to go into an argument to show that Michigan ought to be interested in Forestry. Every one knows what an element the forests have been in our prosperity. According to a late report of the Commissioner of Immigration, "the aggregate value of the forest products of this state, already marketed, is largely in excess of $800,000,000," and the timber product of a single year, 1879, amounted to $60,000,000, or about thirty-five per cent of the total value of the natural products of the state for that year. Michigan produces more salt than any other state in the Union, and the brine is evaporated by means of refuse from the great sawmills in the vicinity of Saginaw and other lumbering towns. Ours is the second state in the production of iron, and the blast-furnaces of Ironton, Elk Rapids, and a number of other places, are drawing their supply of charcoal for its reduction from the great hard-wood forests in their vicinity. The products of these forests are sent to the ends of the earth. Much of the finest lumber of the Atlantic cities and of the Old World comes from Michigan pineries. Threshing machines made in Battle Creek are sold in South America and Australia, and farming implements, furniture, and a long list of articles requiring wood in their manufacture, are made in the state and exported from it, their manufacture a source of support to fifty thousand of our people, and their sale a steady source of wealth to the state.

Nor is it necessary to repeat the well-known fact that our forests are rapidly disappearing. The bulletins of the last census, accessible to every one, show that the estimated amount of merchantable pine timber standing in Michigan, May 31, 1880, was thirty-five billions of feet. At our present rate of consumption, five billions of feet annually, it will take seven years to use up our pine forests.

Suppose, however, that the estimates of the amount remaining, although made with great care, are too low; suppose, for safety, that the pine will last twice as long as has been estimated, the fact still thrusts itself upon us that, in a few years, this great source of our wealth will be gone.

What are we doing, in view of these facts? We are going on with astonishing energy and improved machinery to hasten the end. Every man who can do so is trying to get a piece of pine land or a quantity of logs before they are gone, and our own people, in company with eastern capitalists, are planning the speedy destruction of the hard-wood forests as soon as the pine lands have been stripped. The newspaper articles that charge these things upon us are not sensational. They do not tell all the truth. We have squandered with reckless haste the abundant forest-wealth with which the state was endowed, and, besides all this, time and again, forest fires, that might have been prevented, have swept over fair portions of the commonwealth, carrying swift destruction with them, and completing the work that the ax had begun.

In the study of this subject, then, we may as well turn our attention at once to the forests of the future, for it is evident that those of the present will be gone in a few years. Our own legitimate wants and the great profits of the lumber trade have already settled the question for Michigan. If we want forests, we must make them.

Without repeating the arguments that have been given so fully by others, I shall assume, what is admitted by every one who has ever bestowed serious thought upon the subject, that the highest welfare of the state requires the establishment and continued maintenance of a suitable proportion of woodland. It may be assumed, too, that, in due time, both government and people, moved by necessity, if by no higher influence, will unite in a settled purpose to secure this. As soon as this attitude is taken by the people of the state, and we are ready to enter upon the work of reforesting, we shall find ourselves face to face with various difficult practical problems. Some of us, perhaps, may render a service by studying these problems now, viz:

First. What parts of the state, and what proportion of its area should be covered with forests?

Economists estimate about twenty-five per cent as a suitable proportion; but this varies with the position, physical character, and commercial interests of the state or country under consideration. The State of Michigan contains large areas that are worthless for any other purpose than raising timber, and still more extended regions that, if not absolutely valueless for agricultural purposes, can be used to far better advantage in growing trees than in raising any other crop whatever. Undoubtedly, the great question with us is, how, in the most direct, practical way, can we rehabilitate the extensive regions in the central and northern parts of the Lower Peninsula, that have been stripped of their pine forests, and the remaining portions of this region that will so soon be bare? Any one who has been through this part of the state will remember its desolate and ruined aspect. "The valuable trees were all felled years ago, and the lumberman moved on to fresh spoils, leaving behind an inextricably confused mass of tree-tops, broken logs, and uprooted trunks. Blackberry canes spring up every-where, forming a tangled thicket, and a few scattering poplars, birches, and cherries serve for arboreal life, above which tower the dead pines, bleached in the weather and blackened by fire, destitute of limbs, and looking, at a distance, not unlike the masts of some great harbor. Thousands of such acres, repellant alike to botanist and settler, can be seen in any of our northern countries." *

While there is good soil to be found in this region, much of it is light and sandy, altogether unfit for farming purposes, but it has raised one of the finest forests that ever clothed the surface of the earth, and if it can again be covered with such a forest, it will become in the future, as it has already been, a source of almost unlimited wealth.

Another portion of the state will soon force itself upon our attention, unless it is cared for. All along the eastern coast of Lake Michigan, sand-dunes extend, precisely similar in their nature, though of less extent than those of the Old World. While these dunes are covered with vegetation, they keep, for the most part, within their limits, but indications of what they may do, when free from such control; may be seen any day at Grand Haven, Michigan City, and other places along the shore, where piles of light, drifting sand are covering railroad tracks and fences, and even trees, and in some lo-

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* Erwin F. Smith, "*Flora of Michigan.*"

calities are encroaching upon cultivated fields, to the dismay of their proprietors. The experience of Western Europe is conclusive upon this point, and it is the manifest duty of the state and of the people to absolutely prohibit and prevent the clearing away of trees, or even excessive pasturage of such lands, and to encourage by every suitable means their reforesting.

The farming lands in the southern portion of the Lower Peninsula all need a fair proportion of woodland for fuel and shelter, and the great majority of these farms would be rendered much more valuable in a few years by judicious planting of trees; and the Northern Peninsula, though still heavily wooded over large areas, already has extensive regions that have been stripped of their forests, and that can be turned to better account for this than for any other purpose. We may safely conclude, therefore, that the State of Michigan requires fully as great, and probably a greater, proportion of its area to be kept in woodland than has been estimated as necessary for other countries; in other words, more than twenty-five per cent in this state, rather than less, may properly be covered with timber.

Second. What kinds of trees shall we plant?

To answer this question, we must know something about the different species of trees, the soil and climate to which they are adapted, or to which they can be induced to adapt themselves; what kinds will endure unfavorable conditions best; what trees will grow rapidly, and what sorts are most valuable for timber or other products.

Without attempting to decide all of these questions in detail, many of them requiring not only careful study but long experiment, for which, as yet, the state makes no adequate provision, there is one very important question suggested at the outset, and that must be met, whether it can be settled at once or not. The question is, how much significance much be attached to the principle of rotation? It has been commonly noticed that forests of oak succeeded those of pine, and *vice versa.* Oak and hemlock forests have been succeeded by those of beech and maple. When the pine woods in the northern part of Michigan and Wisconsin are cut off, poplars, birches, and the wild red-cherry spring up, and so, as in many cases, this succession seems to be pretty uniform and constant, there has grown up a half-popular, half-scientific notion that it must be so, and that, if we are to succeed in re-foresting our denuded pine lands, we must follow the order of nature. We have no right, however, to follow nature blindly, and sometimes we can take a short cut while nature is going round a corner.

No one has ever formulated an order that governs the succession of forest trees, nor has it ever been shown that there is any such unvarying order or succession. On the contrary, it is one of the most variable things with which we are acquainted, and there is every reason for believing that it depends more upon what the ground is seeded with, than any thing else. The reason why birches, poplars, and wild red-cherry trees spring up on our wasted pine lands is, that the seeds of these species are carried there by the wind and by the birds, and there is no doubt whatever that other and better trees may, with suitable pains, be made to take their place. When we plant trees about our houses or along the highway, if it happens to be new land, we do not stop to make a critical inquiry into the laws governing the succession of forest trees; we find out what trees are hardy, and, having settled this point, set out whatever kinds we fancy, with the expectation of having them do well if they are cared for.

Shall we, then, plant the white-pine in Michigan? The answer may be given without hesitation—yes, plant it first, and last, and all the time. Give it a fair chance, and it will cover the state again. It may be wisdom to substitute some other species on those tracts that have just been covered with pine, but it is, to say the least, doubtful whether any such distinction need be made. If the white-pine were planted in Michigan universally, and every-where where the land could be spared, it would find congenial soil enough, even in those counties that have produced the most of it.

Without discussing the value of other well-known species, a few may be mentioned as specially worthy of planting in Michigan. The European larch, famous for the durability of its timber, and perfectly adapted to our northern climate; the *Ailanthus*, the only tree that has successfully controlled the drifting sand plains of Southern Russia, and will, perhaps, be more valuable than any other on our sand-dunes;* the *Catalpa speciosa,* of which specimens a foot-and-a-half in diameter may be seen in Ann Arbor, and which probably may be depended upon for hardiness throughout the southern portion of the Lower Peninsula; the white ash, and a long list of other indigenous trees, any of which may be planted with every reason to expect a good return. The consideration of the large number of species, both indigenous and introduced, that may be successfully cultivated in Michigan is of great importance, but requires too much space for this article, and will have to be taken up in a separate paper.

Third. Admitting that it is desirable that the planting of trees in Michigan should be undertaken at once and in earnest, what are the means of securing this and of insuring the best results?

1. The legislature of the state may promote the work by offering encouragement to tree-planting, in the way of exemption of property from taxation. As to the form of legislation and its practical details, a careful study of the action of other states will furnish valuable suggestions. Of all state laws on the subject of tree-planting that have come to my notice, that of Iowa has seemed pre-eminently adapted to the purpose. The law provides that, "for every acre of forest-trees planted and cultivated for timber within the state, the trees thereon not being more than twelve feet apart† and kept in a healthy condition, the sum of one hundred dollars shall be exempted from taxation . . . for ten years after each acre is so planted: Provided," etc. Possibly, other forms of legislative action on the subject may be found better, but that of Iowa has this very excellent feature, that it has very largely accomplished the object aimed at. We can profitably follow the example of Iowa, too, in securing the preparation and distribution of something corresponding to their "Forestry Manual," an unpretentious pamphlet of about thirty pages, filled with valuable information and practical hints on the subject of tree-planting, and distributed gratuitously among the farmers of the state.

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* How far north the *Ailanthus* will prove hardy, even on the eastern shore of Lake Michigan, is still to be determined by experiments.

† Closer planting is now recommended and practiced.

2. The state ought also to be establishing facts upon which to base the future management of the great work of reforesting its waste lands. Two or three experimental stations, located in as many parts of the state, where trees of all sorts, both native and foreign, can be cultivated, and the results recorded, would enable us in a few years to demonstrate the usefulness of some kinds and the unfitness of others for general cultivation.* Meteorological observations carried on at these stations would give data for the solution of the difficult but important questions relating to the climatic effects of forests.

3. Very much depends upon the railroad companies. Owning, as they do in the State of Michigan, lines aggregating over four thousand miles in length, with large grants of valuable land, they control, in a very great measure, the agricultural and commercial interests of large areas of the state. The Detroit, Mackinac and Marquette Railroad alone owns over one million three hundred thousand acres of land, and the Flint and Pere Marquette, the Grand Rapids and Indiana, and other roads are possessed of large tracts of both farming and timber lands. An abundant supply of wood for ties and manufacturing purposes is a prime necessity of all these lines, and may be secured by the prompt adoption of a liberal and enlightened policy in maintaining or restoring a suitable amount of forest on their lands. A number of western railroads, though obliged to contend with great natural disadvantages, have taken hold of this work with great enthusiasm, and several of them are now employing paid foresters to direct the work of raising and caring for forests along their lines.

4. The farmers of the state have very much to do with the future of our forests, and, unfortunately, they have not yet, as a rule, taken a practical interest in maintaining or restoring them. There is, however, no class more ready to enter into undertakings that promise to be productice of good, and none more accustomed to overcome difficulties. When the farmers of Michigan are once possessed of the conviction that trees are often far more valuable than any other crop, and that

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*Experimental planting has been carried on for some years at the Agricultural College at Lansing, and the facts already established amply justify the expense incurred.

they render the farm more productive and worth more per acre, trees will be planted.

5. A few, at least, of the educational institutions of the state can do an important work by giving Forestry an honorable place among the subjects of their respective courses of study. Whether there is as yet a science of Forestry in the United States or not, there will be before long, and intelligent and interested action on the part of such institutions will aid greatly in establishing the science, and in gaining for it the confidence and encouragement of both government and people. A beginning of this kind has been made at the University of Michigan, in connection with the school of Political Science recently established there, and the lectures on Forestry are attended by a class of about fifty.

6. The general government still owns something over a million acres of land in Michigan, and the state government has yet large tracts of land under its control. If, instead of throwing this away or selling it at the rate of a dollar and a quarter per acre, any considerable portion might by any means still be kept in permanent forests, under the control of the state government, and this control be exercised wisely and for the public good, as is done in the state-forests of the Old World, Forestry in Michigan would become an established fact.

LARCH-WOOD.

A Plan for Tree-planting on the open Prairies of Iowa and elsewhere—Groves, Shelter-Belts, Wind-Breaks and White-Willow Hedge-Rows on every Farm of one hundred and sixty acres, or Quarter Section—Species Planted—Modification of the Climate.

BY DR. JOHN A. WARDER, OF NORTH BEND, OHIO.

AN enterprising citizen of Illinois, who had already done good work at tree-planting upon the open prairies, in anticipation of the settlement of the town of NORMAL, which has sprung up around the State Normal School of Illinois, has thus made himself a name, and deservedly a fame also, as a benefactor. This will be acknowledged by all travelers on the two railroads that cross at that point, and certainly by all the dwellers in that pleasant town, who may thank

Jesse W. Fell for thus anticipating their need of shade by his extensive planting of street-trees on the new town-plat some years ago.

This inspired him to further effort, and he located a tract of land in the northern portion of Iowa—a region of open prairie that was absolutely without trees—for, in all that portion of the state taken together, the timber land amounts to but a single acre to the section, of a mile square, or one acre to 640 acres. Here, then, was as fine an opportunity to test the benefits of systematic tree-planting for shelter as could be desired.

With the aid of some capitalists, a large tract of land was purchased; of this nine sections were selected in a solid block of three miles on each side, which would make 5,760 acres, and might be divided into thirty-six farms of a half mile square, or a quarter-section each—a very convenient and favorite size for purchasers of moderate means.

The plan adopted by the proprietors to make this land attractive to settlers is now to be detailed: It was the result of the studies of Mr. Fell, whose forethought has secured to the purchasers the benefits of wind-breaks, shelters, and growing timber already started, and offering their beneficial influence to the coming settlers. This planting, which, in time, might have been carried out by the future settlers separately, as has been done to a considerable extent in some prairie regions, has this great advantage, that it has been done beforehand, and is ready for their enjoyment at the first, when they have so much to do in establishing a new home. But more than this, all the purchasers will, from the first, have the full advantage of the shelter furnished by the trees on the adjoining tracts of the whole area thus planted, which is a quarter of a township of government survey.

Without this unity of design and this provision of planting in advance, the probabilities are that a diversity of views might prevail among the settlers; and that some would neglect planting altogether, actuated by a selfishness or niggardliness, hoping to reap the benefits of others' labors, and to retain all of their own land for arable purposes.

But to the plan, and to the work. In the years 1870–71 the center forty-acres of each section was broken (plowed).

This would occupy ten acres in the adjoining corners of each quarter-section. In the following two years these forty-acre tracts were planted with trees and cuttings of the hardy native trees, and the foreign White-Willow—whatever was known to be adapted to the soil and climate. These were set on the outer side of the forty-acre tract, so that in a future occupation here would be lots within a belt of sheltering timber, for the buildings and fruit trees of the four adjoining farms.

Roads were located on all the section and half-section, being half a mile apart. On both sides of these lines the prairie sod was broken four rods wide, and on either side of these lines White-Willow hedges were made by setting the cuttings. These amounted to more than forty miles in 1878, at which time each farm, or quarter-section, had already growing upon it several thousand trees, established, and many of them from ten to thirty feet high.

The planting was progressive, and the hedges have been extended to sixty miles. Various kinds of trees have been used in these plantations. White-Willow, Box-Elder, White-Maple, White-Ash, Cotton-Wood, Bass-Wood, Black-Walnut, Honey-Locust, Chestnut, Osage-Orange, European and American Larch, White and Scotch Pines, Arbor-Vitæ, Norway and Native Spruces, and others.

It should have been stated that the center-forty of the center section was appropriated as a town or village plat, and here the highways for future streets were all planted with shade trees, in advance of the buildings, on the plan which had proved so successful when practiced by Mr. Fell years before in the village of Normal, Illinois, as already mentioned. This embryo village was called by its founders LARCH-WOOD, and it already has its place in the official Postal-Guide as a recognized office for the distribution of mails designed for that part of Lyons county.

With a tract of land of even a few thousand acres thus planted and thus sheltered by trees to check the trying winds, both of summer and winter, who that has once seen and realized the benefits of these wind-breaks will doubt the influence of trees upon the local climate, and their agency in producing and retaining the humidity of the atmosphere so essential to our crops and to our comfort or that of our cattle? Let such planting become general, and who can say that the climate of a whole region may not be measurably reclaimed from the aridity and severity that now prevails; and who will say in advance, that such a covering of the surface, if carried on over still wider and more extensive regions, can not, and will not affect the average annual amount of rain-fall? And yet, we are told, on high authority,* that "to plant one hundred acres in trees, with the view of increasing the rain-fall on the adjoining one hundred acres of arable lands, seems to us a very weak proposition." Now, to many of us who have realized the benefit of wind-breaks on the prairies, it is no longer a *weak*, but a *very strong proposition*, that judicious and extensive tree-planting does and must modify the *local climate* for our benefit, and that it might well affect the annual rain-fall. Time may be necessary to eliminate the possible errors arising from cycles dependent upon cosmical causes that are not yet fully understood; but let us have credit, and let the judicious plantations of trees have the credit for their influence in modifying the local climate of the farms, townships, counties, and states, where we do know that such meliorating influences are sadly needed.

Experiments have been made, and are now in progress at Larch-Wood, with plantations of the *Catalpa speciosa*, and with encouraging results, notwithstanding the severity of the winter climate of north latitude 43°, on the high rolling prairie. So well satisfied are the proprietors of the plantation with this tree that they have contracted for 50,000 plants, to be set out next year.

Owing to financial troubles of the past years, during which these rather expensive experiments have been in progress, Mr. Fell and his associates have sold their interest at Larch-Wood to an English company, who are carrying out the plans so well begun by him.

In a recent letter, in replying to inquiries as to the present status of their plantation, it is reported: "On sixty-one quarter-sections of land we had planted 323 acres of forest trees, that are now in various stages of development, from those newly planted to trees nearly forty feet high. Further, we had planted on the survey lines, within a more limited range, 53 68-100 miles of Willow-hedging, and one mile of Osage-Orange. The latter utterly died out at the end of the second year."—*J. W. Fell.*

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*Wm Saunders, Horticulturist, U. S. Department Agriculture.

Recent correspondence with the proprietors of Larch-wood represent these plantations as being very thrifty, and that they are extending them annually.

THE FORESTRY OF THE FUTURE.

A Paper Read at the American Forestry Congress, held at Cincinnati, April 27, 1882, by Franklin B. Hough, Ph. D., Chief of Forestry Division, Department of Agriculture, Washington, D. C.

WE learn the probabilities of the future from what we know of the past, and reasoning from this experience, let us, on this occasion, look ahead, and strive to learn what the future promises in the way of resources and opportunities, and what are our duties in respect to the waste of forest supplies that we see going on around us.

A century ago, our settlements then scarcely released from colonial dependence, hardly extended a day's journey beyond tide water upon the Atlantic coast, and, if we except the beginnings that had been made within these limits, and the prairies on our western and still almost unknown border—and places here and there made void by fires or other causes—the whole of our territory as then claimed, was one vast forest.

Admitting that this amount was relatively too large for the occupation of civilized man, we must justify its partial clearing, in order to prepare the land for cultivation. But there is a limit beyond which this can not be safely done. If we pass it, we incur dangers not easily restored—for it takes centuries to reproduce what may be destroyed in an hour, and the history of older countries teaches us, that injuries may be done that are utterly beyond the power of man to overcome.

In Europe they have long since learned the importance of this subject, by realizing the dangers that result from going too near the verge of ruin, and in almost every country they adopted systems of management, tending to conservation and supply.

They have learned that it is necessary to maintain a certain proportion of woodlands, not only for the growth of trees, for the uses to which they may be applied, but also to secure the incidental benefits resulting from their presence, in their effect upon the climate, and the growth of grains and fruits, and in equalizing the flow of waters for purposes of navigation, hydraulic power, and the supply of cities and towns.

In all Europe, the percentage of woodland area is a little less than 30. In Rusia and Finland it is 40, in Sweden and Norway 34.1, in Austria 29.4, in Germany 26.1, in Turkey and Roumania 22.2, in Italy 22, in Switzerland 18, in France 17.3, in Greece 14.3, in Spain 7.3, in Holland and Belgium 7, in Portugal 5.1, in Great Britain 4.1, and in Denmark 3.4.

In most of the countries where the percentage is small dependence is chiefly had upon importation from countries more favored with supplies, and principally from Northern Europe, Canada, and the United States. How long these supplies of Northern Europe will hold out is becoming a matter of anxious inquiry in countries depending upon them to meet their own necessities, and even in these countries themselves, the people are beginning to ask one another—" what shall we do next?"

In a journey made last year in Sweden and Norway, Finland and Russia, I had some opportunity for seeing what these forests are, and are likely to be, if the operations of the past go on for a few years longer. For a hundred miles along the Glommen—and it is doubtless the same in other rivers in Norway—one can see in summer the rapid waters and the eddies of the stream, alive with floating timber, all of which had been peeled, and much of it scarcely larger on an average than our telegraph poles. It is rare that a piece is seen more than a foot in diameter, at the smaller end, and many of them we would scarcely think of using, except for the poles of scaffolding. It has of late years been found more profitable to cut this timber up into narrow floor-boards, and other small lumber before it leaves the country, and heavy timber of large dimensions is now less commonly seen in the markets, or quoted in the trade. The governments have established systems of forest-management in all these countries, for the care of woodlands belonging to the public domain or to municipalities or public institutions, but beyond this, they do not generally attempt to dictate in the affairs of individuals, or to restrain them from clearing as they please. In Sweden they have an excellent School of Forestry at Stockholm, and in both Sweden and Norway they have several elementary schools of recent origin, for teaching the rudiments of forest-science. They have recently begun to establish nurseries for selling young forest trees at cost. The timber of this region (chiefly the *Pinus sylvestris*, or Scotch pine, and *Picea excelsa*, or spruce) is of very slow growth, and a tree 70 years old, in poor soil may scarcely measure six inches across the stump. Indeed, in passing through a crown forest in Finland, I could not but remark the smallness of the trees, at an age that with us would have been of twice the diameter, or four times the sectional area.

How long these supplies will satisfy the demands of trade is a question for the future. As they decline, the deficiency will be made up, so far as can be, from North America—certainly not from other countries of Europe, for there is not one of them, excepting on the Baltic, and perhaps Austria, but that imports more than it sells, and some of them, like England, are almost wholly dependent upon commerce for the supply of their timber wants. But with our 50,000,000 of people, our immense system of railways, our vast and growing industries and increasing wants, what can foreign countries depend upon from us? From whence shall *we* import, as *our* supplies become short?

The late census, as analyzed in a recent speech in congress by the Honorable Mark H. Dunnell, of Minnesota,* shows that from the estimates of standing timber and the returns of manufactures the supplies of pine in the states of Michigan, Wisconsin, and Minnesota, at present rates of use, will last but about seven years.

These three states constitute the whole of what we are accustomed to call "the great timber region of the Northwest." They deliver to the markets a sufficient amount of lumber to lay an inch floor fifty feet wide around the earth at the equator, in a single year, and the amount received at Chicago alone would lay such a floor, fourteen feet wide, in a year.

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*Delivered March 9. Printed in "Congressional Record" of April 15, 1882.

These estimates, applied to the states of Alabama, Florida, Mississippi, and Texas, shows that the pine might be exhausted in them, at present rates of use in the northwest, in about seventeen years.

But the consumption, instead of being uniform, is going on at a gaining rate, and with this rate the prices must inevitably increase. By the construction of railroads in recent years, the lumbering operations which could formerly be only carried on along floatable streams, are now extented into the interior, and the delivery once dependent upon a favorable winter, and seasonable floods, is now going on at all seasons of the year, and sometimes by night as well as by day.

In speaking of the influence of railroads upon our timber-supply, Mr. Dunnell in the speech already noticed, says:

"The vast and rapidly increasing extent of our railroad system, which at the present moment can scarcely be less than 100,000 miles,* has a most important bearing upon the question of our forest supplies. This effect is not limited to the vast consumption that they occasion, in supplying ties and other timber materials for the new construction and renewals that are constantly going on. These roads are every-where penetrating the timber regions of the country, many of them being built for the express purpose of getting out the timber that was before inaccessible by the old methods of floating upon rivers, or hauling in winter by teams. It is but a comparatively recent period since this feature in lumbering was introduced, and its direct and speedy effect is, to hasten the exhaustion of these supplies that were already going off too fast for the needs of the present and future. The obvious effect of this will be to keep up the supply at the mills, so long as there are forests from whence it can be obtained. They will distribute the manufactured lumber over a wide area and to greater distances, to meet the wants of regions that have already used up their own forest resources, and they will doubtless extend for a little while, the time of apparent 'abundance' and of 'inexhaustible supply.'

"But while they are doing this, they will be every day equalizing the ruin that must inevitably follow this vast and rapidly increasing destruction, that will happen to the country in the near future, unless seasonable and adequate measures are taken to meet these future wants by extensive and judicious planting, and by effectual measures for economizing our remaining supplies. We shall be soon enough admonished of this necessity, by the rapidly gaining prices of our timber; but it is not wise to wait for this extremity until it is upon us; we should anticipate these wants—for it takes many years for a seeding sprout to become a tree fit for timber and boards!"

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* Actually over 105,000 miles at the beginning of 1882.

I regard this as sound advice based upon valid premises, and acting upon this suggestion, let us attempt to consider what these "seasonable and adequate measures" may be, in order to avoid the injurious consequences that seem to be threatened. They are foreshadowed in the words—"by extensive and judicious planting, and by effectual measures for economizing our remaining supplies."

We will take these as the words of our text, and endeavor to examine them, and understand what they mean. As to *planting*, whether on an "extensive scale" or but a single tree, it is fairly reasonable to assert, that it will never be done excepting by the owner of the land, or by his procuring and for his benefit. It will not be by a tenant, unless he is paid for the service, or is assured of a share of the profit. But in timber-culture, the returns are many years distant, and no planter can expect to cut the full-grown oak that he plants and nurses, nor in his own lifetime expect any other profit from it, than what it gives to the land on which it grows.

Now the whole of our lands, from one end of the country to the other, so far as settlements extend, belonging absolutely to private owners, or will belong to those in occupation, upon the fulfillment of certain conditions promised, and that can not now be changed.

The title is granted or assured to them without any conditions whatever, as to the cultivation or reservation of timber or other crop. In no country in the world, does the government attempt to control private owners in this respect, with the exception of a few cases where public isterest is involved, and in these, where a sacrifice of interest is required, the owners are generally paid for it by those who are benefited.

It is among the plainest of probabilities, that neither the National, State, or Local Governments will ever spend money in planting upon private lands, and it is almost as certain that they will never attempt to re-purchase these lands for purposes of timber-culture. The States might, and sometimes should, retain in their possessions such broken lands as have been abandoned by their owners as not worth the taxes upon them, and adopt measures for their reservation for timber-growth; but we will not here further consider this point.

If, then, the planting so much needed, must be done by the owners of the land, they must be first convinced that there is profit in it, and the present tendencies of the markets appear to indicate, that this conviction will only be brought too soon. But here we would impress a point, as an effectual answer to the remark we so often have made—"that a man can never himself derive any profit from planting trees,—because he may not live till they are grown,—and that a future generation can alone be benefited by this labor."

So far as the actual use of the material goes, this may be true,—but let us consider it in another point of view. "We hold this truth to be self-evident," that a piece of land—perhaps too broken for cultivation, or exhausted from tillage,—or better still, a liberal part of a good sized prairie-farm, as rich in soil as the best around, if carefully and judiciously planted with forest trees, best suited to the conditions, will be worth to the owner after planting, as much more than it was before, as the plantation has cost him. If it could be sold for the former price *plus* this investment, he is so much richer than before. He has added this amount to his capital, and put it at interest. If, from necessity or choice, the property is sold at any time afterwards, it should, and I think very generally would, bring as much more from year to year, as the gain acquired by growth. The holding of this property, implies that the owner has other means to live on, while this portion of his estate is growing, just as in case of other invested capital. No man can hold stocks or bonds bearing interest, or paying dividends, unless he has other means of subsistence, or enough to enable him to wait till the next payment.

Now, to show how this possession will increase in value, I will use a mathematical illustration that I have used before. A tree consists of concentric circles of growth, in some years wider than in others, but for the sake of argument we may fairly assume that they are true circles of equally increasing width, and, till the tree approaches maturity, this is not far from the exact truth. If we count these circles from the center out, we have the series 1, 2, 3, 4, 5, 6, etc., representing the age of the tree from year to year.

Now circles are to each other, as the squares of their radii, and the areas of these circles (each including what is within it), are 1, 4, 9, 16, 25, 36, etc. By subtracting each of these from the one before it, we have the actual gain in sectional areas from year to year, in the series 3, 5, 7, 9, 11, 13, 15, etc., increasing at a common interval of 2, or at double the rate of the first number. In other words—in the fifth year the increase is three times as much as the second, the seventh three times as much as the third, and so on.

Now what particular farm crop gains from year to year at these rates?—or what railroad, mining, or other stock companies increase their capital in this way? It is true that it begins in a small quantity, but it is not long before it has a money-value, and produces in succession a growth that can be used for stakes, poles, rafters, posts, and so along up to timber large enough for framing, and sawing into boards.

In the calculation just made, we have not noticed that while a tree thus gains in sectional area and volume, it is growing in height, and the wood is increasing in value per cubic foot, on account of its better quality, and the more important uses to which it may be applied.

It is further true, that the trees must become fewer in number as they become larger, by the thinning out of a part, in order to make room for the rest. But these thinnings themselves have value almost from the first, and as wood is now sold in most countries in Europe, they have a market price that more than pays for all the cost of planting and management, leaving the growing crop to represent the clear growing value of the estate.

The rate of this gain, depends upon the goodness of the soil in which the trees grow, and we take the words "judicious planting" in our text to mean, the intelligent selection of the kinds of trees that will bring the most profit to the owner under the given conditions.

We will not try to prove the self-evident fact, that rich land will bear more timber than poor land, nor deny that land may be so poor, or the climate so dry, that it will bear nothing. But we should not grudge the use of good, rich prairie soil to trees, and the rings of growth, and the rates of gain, will be so much the greater for it.

In a soil once fertile, but exhausted by improvident tillage, the loss of fertility applies chiefly to the surface, and if we go below the distance that the roots of the grain extended, we may generally find a sub-soil still rich in the elements that give rigor to the growth of plants. In the approved modes of agriculture, we seek to reach and bring up this sub-soil by deep plowing. The roots of trees can do it better, because they can go deeper. In ledgy and broken ground, they can insinuate themselves into crevices that have been filled with rich soil washed in from the surface, and that we could never use by any other means.

Again, there may be a surface-soil that never has been cultivated, and never could be, underlaid by a sub-soil that is of itself still more worthless, and yet there may be conditions that render this a splendid opportunity for the growth of trees. I will ask a few moments indulgence to illustrate this apparent absurdity:

In the course of a journey made last summer in Europe, for the purpose of gaining information on the subject of Forestry, there was nothing in the whole ten thousand miles of travel upon the continent that interested me more than the Dunes and the Landes of Southwestern France.

The "Dunes" are sand hills that stretch for a hundred miles along the coast, between the Gironde and the Adour, from one to six miles wide, and from one hundred to two hundred and fifty feet high. They were sands cast up from the sea—utterly naked—shifting with every gale of wind, always changing in form, and creeping inland more and more. By closing the mouths of streams, they formed a series of ponds behind them. Between the rivers above named lay the "Landes"—a vast region almost level—the first twenty inches or two feet of the soil almost pure sand, and below this an indurated stratum of about equal thickness of hard-pan, and still below, pure sand to a great depth. This hard layer was wholly impervious to water, and in the heavy winter rains, this entire region was half inundated. As the natural drainage was obstructed, the waters slowly evaporated in the heats of summer, breeding malarial fevers every year. The few wretched inhabitants became accustomed from childhood to walk upon stilts, by which means alone they could lead their hungry flocks to pick the scanty herbage that grew here and there on that desolate waste.

In 1785, *Nicholas Brémontier*, an Engineer, undertook to plant the Dunes with the Maritime Pine, and now the whole of these shifting sands along the shore (about 148,200 acres in amount), are planted with forest-trees. I can not here describe the ingenious methods by which this was done, and is maintained; a monument erected many years ago at La Teste, in the midst of the pines that Brémontier planted, tells what is thought of *him* in that region.

But the desolate Landes still remained a wretched waste, alternately inundated in winter, parched with summer heat, and haunted every year with fevers. There were difficulties other than what we have mentioned, in its soil of sterile sand and solid bed of hard-pan. It was chiefly owned by the Communes, and the inhabitants had common property and rights of usage. They might wade from place to place where they pleased, and pasture their sheep wherever they could find a little herbage, all having equal rights within these local public lands.

They were extremely ignorant, wholly illiterate, superstitious, jealous of innovations, and knew of no better ways than those of their fathers. There were plans of various kinds devised from time to time for improvement, but nothing could be done without the consent of the local authorities. There could not be found perhaps a stronger combination of circumstances against improvements of any kind, either in the condition of the soil, the title, or the prejudices of an ignorant people.

About a third of a century ago, a Government Engineer, still living, named CHAMBRELENT, was sent into this region to lay out the work of some canals, for connecting the ponds behind the Dunes. An accident suggested to him the study of this subject of improving the Landes, by planting the Maritime Pine. This tree was a native of that region, but had not seeded itself upon the half-drowned portion, because the seed could not get sprouted until midsummer, and then they perished. If they could get started in the spring, the trees would "grow like weeds."

So in June, 1849, he bought 500 hectares (1,235 acres) in the midst of the poorest part, and caused it to be drained by broad shallow ditches—a work easily done in the sand—and it was not difficult to lay them out so that they slightly descended toward the sea. The heavy winter rains almost immediately drained into these ditches, and the surface remained dry. The water slowly flowed away, in a limpid stream, without erosion or obstruction, and he could now sow his seed, so as to catch the first warmth of spring. Success attended his first efforts, and the very first season, saw the whole surface waving in the wind, a stout growth of very small forest-trees.

He persuaded an Insurance Company to make a large investment in land, and in its drainage and planting. In 1855, five years after his first seed were planted, over 50,000 acres had been drained, and his first plantation was twelve feet high, and well developed. Specimens were sent to the Universal Exhibition at Paris the next year, and this led to the appointment of a committee of the Institute to go down and see for themselves. Their report led to the passage of a law in 1857, allowing the Communes to sell a part of their lands, and to expend the money in draining and planting the remainder.

It was at once found by speculators that there was "money in it," and the price of land went up several hundred per cent. A general plan of drainage was laid out, with very large main and smaller secondary canals, and the lands that were sold, as well as those retained by the Communes, were put under the new improvement as fast as the drainage progressed. The very superstitions of the people hastened the operation, because they thought that whenever Chambrelent advised, there was *luck in it.* And now mark the result:—There are at the present time a million and a half of acres of Maritime Pine on the Landes. It has already grown so large as to furnish abundantly fire wood, charcoal, staves, telegraph poles, posts, railway ties, mining props, hewn timber and sawn lumber.* Along the railroad between Bordeaux and Bayonne we see at every station the evidences of this in great piles of pine

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* A publication of the Forest Administration, issued in 1878, entitled "*Notice sur le débit et les emplois des principales Espèces de Pins,*" gives the following summary of the work of planting the Landes:

"It is shown from official reports, that on the vast triangle formed by the shore, the Gironde and Adour, the surface actually wooded, amounts to 711,525 hectares (1,757,467 acres), viz:

"Of the Landes sown since 1857, 616.526 hectares (1,522,817 acres).

"Of the Landes sown before 1857, 35,000 hectares (86,750 acres).

"The Dunes, 60,000 hectares (148,200 acres).

"The sowing done since 1857, now averages 18 years old, and the product in wood is already very great. Perhaps some might fear that the large amount already sown would reduce the price; but by a phenomenon in trade that is easily explained, the outlet has increased with the production. Not only this, the price has increased, since that which sold ten years ago, at the rate of 35 francs, now brings 55 francs. This partly comes from using up the small pieces taken out in the trimmings, which a few years ago were left on the ground. Many roads now traverse the Landes in all directions; they are making railways, and the means of communication are increasing still more rapidly the production of wood. Thanks to these facilities for freight, and the nearness to a great commercial center like Bordeaux, where capital is abundant, and can never lie unproductive, the wood of the Landes, when worked, is being sent not only to ports of France, but to England, Belgium, Switzerland and even America. Firewood is sent in great quantities from Bordeaux to Paris. Stakes, poles, etc. are supplied for the vineyards, which cover 190,000 hectares (469,300 acres in Gironde, and 200,000 hectares (494,000 acres) in Charantes. Since 1870, mine-props have been in growing demand in England and Belgium. Telegraph poles are sent to various parts of Europe, and so of other articles to a great extent.

"These facts are proved in a very evident manner from the business done by the 'Compagnie du Midi,' which shows that this railroad took off from its stations upon the Landes—

"In 1875, 357,719 tons of wood.
"In 1876, 453,880 " "

"Besides this, there should be added the amount going to Bordeaux by land, and that sent out by the Adour. The actual production is 600,000 tons a year, for the various uses noticed, and it may be safely estimated, that when the 60,000 hectares on the Dunes become fully productive, the yield will be increased at least four fold, a market still opening as it increases, for all of these products."

This report presents in detail the prices and dimensions of the various articles produced. One of these is broom-handles, of which about 15,000,000 are made every year at Bordeaux, from the young pines that are wood and lumber of every kind, awaiting its chance of delivery, and every day they send off long trains heavily loaded with these forest products that have grown since 1850, and some within less time. There are saw-mills, wood-working establishments, works for reducing wood to paper-pulp, charcoal kilns and turpentine distilleries, and all along the way for more than seventy miles, we see among the thrifty young woodlands, the trees now from six inches to a foot in diameter, in full course of working for the production of turpentine. For this, long shallow incisions are made, but little wider than a hand, but extending up some twelve or fifteen feet high, and when the tree is to be cut soon, several to a tree, with as much of bark between them.

They are not such wounds as we see in our southern forests, that will kill the trees in four or five years. Instead of cutting a great hole into the wood to receive the turpentine, it flows down into earthern jars suspended to the tree, and which are emptied from time to time. These strips, after a time, are allowed to grow over, and then are cut again, so that they go on producing for thirty or forty years, and then when cut for timber the wood will be better for some uses than before.

(To be completed in the next number.)

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thinned out, and were formerly thrown away. They are sent in large quantities to various countries in Europe, to both Americas and Australia.

The railway ties are of no value without being injected, by the Boucherie process (sulphate of copper), and, to some extent, by other methods. They are used throughout Western France, and in Algeria and Spain. Their cost and durability, when compared with oak and beech, are as follows:

Oak (not prepared), 5 francs each, will last 15 years.
Beech (prepared), 4 francs, 80 cents each, will last 12 to 15 years.
Pine (prepared), 3 francs, 25 cents each, will last 10 years.

A process of preparation by the vapor of water and creosote, and another by external carbonization had been more recently introduced. The telegraph poles prepared by the Boucherie process, either in close vessels or by pressure, were sent to all parts of France, England, Belgium, Switzerland, Spain and Algeria. They should be at least 25-year-old timber, and varied from 1 to 6 francs in price, and from 6.5 to 12 meters in length.

FOREST FIRES.*

By H. C. PUTNAM, Eau Claire, Wis.

FOREST fires in Michigan, Wisconsin, and Minnesota occur, and are the results mostly of carelessness on the part of explorers, or timber hunters, hay-makers, and others having either business or pleasure in the woods, who leave their camp-fires burning, when they have cooked a meal or spent the night. This is generally in the months of July and August, when the pine leaves and branches from the last winter's cutting are dry and like tinder, liable to burn from the dropping of a match or a stroke of lightning. There is no *necessity* for this *criminal* negligence. *Proper laws* and their enforcement a few times will set the careless ones to thinking, and they will put out their camp-fires and be careful where they drop a match. It may seem hard to detect the offender, but it is not. Most men can be traced easily even in the pineries, and if fires result from their acts they should be punished by imprisonment or fines.

Each State should enact special laws on this subject, then circulate full information and cautions, so that *ignorance* can not be pleaded.

The practice of lumbermen cutting pine in the winter is this: A tree is felled, the branches are loped off and lay scattered over the ground; the summer following these become very dry and are like powder. A match thrown away, an emptied pipe—any thing with even a spark of fire attached will start the burning. Being scattered so evenly over the ground, fire spreads and gathers force, and does not stop at the end of the old choppings, but runs on into the green forest; so where perhaps 80 acres was *cut*, double that or more may be burned or killed.

A remedy for this would be a law requiring the lumbermen to employ an extra man in the woods, and carefully *pile* these green pine branches and refuse in open spaces, where they may be burned at the right time, or should they take fire from accident fire may not *spread.*

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* This article was written for the Cincinnati Forestry Congress, but was delayed by reason of the author's absence upon a journey to the Pacific Coast.

The extra expense is very little, and a large porportion of forest fires can be traced to these scattered dry pine leaves, ready to catch.

After the first season, there is but little danger of fires in these old choppings, as the pine leaves drop off and green hard woods, maples, poplars, etc., spring up and the danger is over in a great measure.

We have not been able to trace any forest fires to so called "Indian" work. The Indian builds a very small fire and hovers *over* it for warmth. He says, "White man build heap big fire and no can come near him."

The Indian always carefully extinguishes his camp fire before he "marches on." So forest fires can not be laid to the Indian. I found in Oregon and Washington Territory, on the Coast Range and Puget Sound two large wind-falls, that occurred 100 years since. The Indians some years since, however, had been in the habit of burning over portions of these wind-falls, so that the deer and elk, which like open plains to feed in, with the forest as a cover, would stay in those particular spots, and not *all* go to the prairies of the Willamette and Yanquina.

The dry sandy soils in many of the pine forests of said States of Michigan, Wisconsin, and Minnesota differ in many localities from the Eastern States, where most of the forests were hard-woods; fewer small streams are found; rain-fall is less; more danger from forest fires. Witness the horrible scenes of Peshtigo and vicinity in Eastern Wisconsin, in 1871, and later in Eastern Michigan, occurring on this dry sandy soil.

There are large areas of a *still* virgin forest, *aside* from the small amount of pine therein, or which has been cut and removed in these three states that can be saved. The practice has been, until within a year or two, by lumberman, to cut the pine timber, and then abandon the land to the country. There would be an average of five pine trees to an acre cut and removed. The remainder of the timber would be small pine-cedar, tamarac, spruce, and the varieties of hard-woods, and unless the fire had ran through one would hardly notice that the land had been cut over.

Now, however, owners are paying up taxes and carrying these cut lands.

On this remaining forest, covering some 60,000,000 acres, as before stated, there is some white pine, perhaps 75,000,000,000 feet, that will be cut in the next ten years. After this is gone, and which at present seems to be the only timber of any commercial value, there will be left the same original forest acres, full of all kinds of hard woods, the cedars, tamarac and spruces, and the young white pines, all of which will become valuable, so that the forest that is left has really more value in its variety of useful trees that are now, or soon will be, in demand for the vast prairie country south and west of us.

There should be foresters appointed and paid good salaries; men of intelligence on the subject, and of integrity and honesty of purpose; their duties being to inform themselves of every part of their district, its wants and capabilities; to collect information; go among the people; to settle in the wooded parts thereof; to instruct them in the use and care of timber, and how to save and utilize it; to have meetings in the country school-houses; to teach people, who do not realize the value of our forests how to care for them, etc. Not one person in ten has any idea of the necessity of care as to forest-fires, and it all comes from ignorance. Foresters should collect and distribute information, and advise as to the manner of cutting timber. Probably as much timber, or as many trees in number are destroyed each year through ignorance and carelessness in cutting the pine timber for saw logs, as there is that are cut, and really used, or taken to market.

As a matter of saving to the state at large, the simple effects of an intelligent forester, to educate the country people, by going among them, and telling them facts, etc., would pay in the end a thousand salaries, to-wit: It is not generally known that even a branch broken from a hemlock tree kills it. The pine is also a sensitive tree; a broken limb or a slight burn on one side brings on decay; hence care should be taken in cutting. Again, fires should *never* be allowed to run, for no pine comes up again on burned land.

Lumbermen sending their men into the woods, exploring or hay-making, should charge them to take extra care of camp-fires.

The northern part of Minnesota and Wisconsin, and the upper pines of Michigan, 50 to 75 million acres of land, is well calculated as a forest reserve or park, from which all kinds of timber that grow in the middle and northern states may be judiciously taken, and still the main forest remain intact, if it is intelligently and practically managed. The prairie states do not *now* perhaps so much feel the need of having such a forest to draw from, but they *will* very soon.

Vast amounts of timber for agricultural implements, railroad ties, telegraph poles, fence posts, etc., are wanted each year. The demands increase as the prairies settle up. This forest is the only one left. A thousand things could be *said* on this subject, but what is wanted is prompt action on the part of those in authority, good laws made and executed, people educated up to the point; and this can be done by the right man or men in each district of said forest, meeting the people at their town-houses, school-houses, and villages, and telling them what they must do, showing them how to do it, and making the common people understand that fires must be kept down, and the originators punished.

The writer has recently visited the forests of the Pacific Coast, and finds there even more danger from fires than in Minnesota, Wisconsin, or Michigan. Terrible fires are raging on Puget Sound, Coast Range, and Cascade Forests. He saw one of 100 miles by 10, and one of 75 by 2 to 20 miles in extent, all the result of pure carelessness and all might have been prevented. But as this article is already too long, we will simply say we can save 1000 trees, where we can raise one. Twenty-five years since, I set out 25 elms in good soil, and under very favorable circumstances, and they have grown well, but they wont average over 12 inches in diameter, and might make 2 cords of wood, if all the branches are cut. If I had educated my timber explorers to be careful of fire, I might have saved millions. Thirty years experience in forests has taught me some lessons. I would that others could see also.

THE AMERICAN FORESTRY CONGRESS:—CINCINNATI MEETING.

AMONG the guests invited by the Government to participate in the Centennial Anniversary of the Surrender of Lord Cornwallis, at Yorktown, in the fall of 1881, were six officers of the Prussian Army bearing the name of Von Steuben, and representing the family of Gen. Steuben, of the American Revolution, and a seventh—Richard Baron Von Steuben, formerly of the Prussian Army, but then Superintendent of Prussian Crown Lands. The latter, in the course of a journey through the country, had noticed the waste and neglect in the matter of American Woodlands, and when at Cincinnati, he took occasion to mention the urgent need of measures for their conservation and renewal.

This is believed to have been the first incident in the movement which led to a call for a Convention at Cincinnati, to be held on the 25th of April, 1882, and the four following days. The suggestion was at once favorably received, and many citizens engaged in the enterprise with great zeal.* Public meetings were held, many committees were appointed, and funds were raised to pay expenses. An immense number of invitations were sent out to every portion of the United States and Canada; Governor Foster, of Ohio, appointed the 27th day of April as "Arbor Day," and Eden Park, in Cincinnati, was designated as a place for planting a great number of Memorial Trees in honor of distinguished persons living and deceased. These preparations were widely noticed throughout the country, and in their arrangement, the ladies took a most active part, and in no small degree assured them of success. They consisted in the planting and dedicating of the trees, a street procession, public speaking at the park, and various reception ceremonies, all of which were planned and executed with admirable precision, and complete success. An enterprising printer had prepared banners, bearing the device of an Oak Leaf, and the inscription, "Welcome, Foresters," and these were displayed by the hundreds, in the principal streets, and from public and private buildings throughout the city. The in-door exercises were appointed to be held at Music Hall, and the reception ceremonies were arranged in a most satisfactory manner.

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*At a future time, and with more ample materials than are at hand, we propose to notice several earlier movements for this object, and particularly The American Forestry Association.

The want of fuller information than we possess, prevents us from giving also, a more ample notice of the earlier measures at Cincinnati, which prepared the way for the meeting at that place in April last. We would willingly afford an opportunity for presenting a statement of these proceedings by any person who might have in his possession the facts needed for its preparation.

These preparations drew together a large number of persons from every part of the country, and from Canada, and in anticipation that something permanent would result in the way of organization, a Committee of Citizens, with Gen. Durbin Ward as their Chairman, had drafted the form of a Constitution. This was considered by a committee appointed on the first day of the meeting, and with some amendments, was approved and adopted as follows:

CONSTITUTION OF THE AMERICAN FORESTRY CONGRESS.

ART. I. This Association shall be known as the AMERICAN FORESTRY CONGRESS.

ART. II. The object of this Congress shall be to encourage the protection and planting of forest and ornamental trees, and to promote forest culture.

ART. III. Any person may become a member of this Congress on the payment of $2. The annual assessment on each member shall be $1.

ART. IV. The officers of the Congress shall be a President, a Vice-President from each State and Territory in the United States, and for each Province in Canada; a Recording Secretary, a Corresponding Secretary, a Treasurer, an Executive Committee, District Committees, Committee on Annual Meeting, Local Committee.

ART. V. There shall be an annual meeting, which shall be held at such time and place as the Congress may determine.

ART. VI. SEC. 1. All officers of this Congress, except as hereinafter provided, shall be elected annually, at the annual meeting, and shall hold office for one year, and until their successors shall be elected.

SEC. 2. The Presidents of the several State, Territorial, and Provincial Associations, shall be the Vice-Presidents of the Congress after the current year.

SEC. 3. The Executive Committee shall be composed of the President, Recording and Corresponding Secretaries of this Congress, one District Delegate from each of the districts hereinafter named, to be appointed by the President and ratified by the Congress, together with the Corresponding Secretary of each State, Territorial, and Provincial Association.

SEC. 4. The Corresponding Secretaries of the State, Territorial, and Provincial Associations within each district shall be a District Committee, of which the respective District Delegate shall be a member, and the Chairman thereof.

ART. VII. SEC. 1. The President shall preside at all meetings of the Congress, and deliver an annual address.

SEC. 2. The Recording Secretary shall keep a record of the proceedings of the Congress, and shall be the custodian of all papers and documents ordered to be preserved, which shall be arranged for convenience of reference.

SEC. 3. The Corresponding Secretary shall conduct the correspondence of the Congress.

SEC. 4. The Treasurer shall have charge of all funds and pay out the same on direction of the Congress, on orders signed by the President and Recording Secretary.

ART. VIII. The following groups of States, Territories, and Provinces shall comprise the several districts:

1st District—The New England States and the State of New York.
2d District—New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, and West Virginia.
3d District—Ohio, Indiana, Michigan, Kentucky, and Tennessee.
4th District—North Carolina, South Carolina, Georgia, Alabama and Florida.
5th District—Wisconsin, Minnesota, Dakota, Wyoming, and Montana.
6th District—Illinois, Missouri, Iowa, Nebraska, and Kansas.
7th District—Mississippi, Louisiana, Texas, Arkansas, and Indian Territory.
8th District—Colorado, Mexico, Utah, and Arizona.
9th District—California, Nevada, Oregon, Washington Territory, and Idaho.
10th District—Quebec and Maritime Provinces.
11th District—Ontario and Western Provinces.

ART. IX. SEC. 1. The Committee on Annual Meeting shall be composed of the President, and Corresponding and Recording Secretaries of the Congress, and the District Committee within whose district the annual meeting of the Congress shall be held, whose duty it shall be to prepare a programme of exercises, and assign to their proper divisions all essays or papers prepared for the Congress.

SEC. 2. The Local Committee shall be appointed by the President at each annual meeting, subject to the ratification of the Congress, and a majority of the members of such Committee shall reside in the vicinity of the place where the next succeeding annual meeting of the Congress shall be held, whose duty it shall be to make all necessary arrangements for the meeting of the Congress, and the accommodation of the Delegates.

ART. X. The Congress may appoint Delegates to kindred Associations, and between the annual meetings the President, Corresponding and Recording Secretaries shall be a Committee, with power to appoint such Delegates.

Art. XI. This Constitution may be amended by a majority vote of the members present (and voting) at any annual meeting.

The officers elected at this meeting were as follows:

President: George B. Loring, Washington, D. C.

Vice-Presidents: *First District*—Maine, George Sawyer, Wiscasset; New Hampshire, Mr. George W. Riddle, Manchester; Vermont, Prof. M. C. Buckham, President of Vermont University, Burlington; Massachusetts, Mr. N. H. Egleston, Williamstown; Rhode Island, Mr. H. G. Russell, East Greenwich; Connecticut, Prof. B. G. Northrop, Clinton; New York, Hon. Horatio Seymour, Utica.

Second District—New Jersey, Prof. George H. Cook, Rutger's College; Pennsylvania, Mr. Thomas Meehan, Germantown; Delaware, Prof. — Purnell, Newark; Maryland, Gov. Hamilton; District of Columbia, Mr. John Saul; Virginia, Mr. W. H. Wickham, Richmond; West Virginia, Hon. H. G. Davis, Piedmont.

Third District—Ohio, Mr. John Simpkinson, Cincinnati; Indiana, Prof. J. Ingersoll, Lafayette; Michigan, Prof. W. J. Beal, Lansing; Kentucky, Hon. Cassius M. Clay, Whitehall; Tennessee, Prof. J. M. Safford, Nashville.

Fourth District—North Carolina, Mr. S. D. Kelsey, Highlands; South Carolina, Hon. D. Wyatt Aiken; Georgia, Richard Peters, Atlanta; Alabama, Dr. Chas. Mohr, Mobile; Florida, Hon. J. G. Knapp, Limona.

Fifth District—Wisconsin, Hon. W. E. Smith, Madison; Minnesota, Hon. George L. Becker, St. Paul; Dakota, Mr. H. M. Thompson, Preston Lake; Wyoming, Hon. John W. Hoyt, Cheyenne; Montana, Mr. C. W. Lombard, Missoula.

Sixth District—Illinois, Mr. Arthur Bryant, Sr., Princeton; Missouri, Mr. S. M. Tracy, Columbia; Iowa, Hon. Chas. E. Whiting, Whiting; Nebraska, Hon. R. W. Furnas, Brownville; Kansas, Mr. Geo. C. Brackett, Lawrence.

Seventh District—Louisiana, ———; Arkansas, Prof. F. L. Harvey, Fayetteville; Texas, Prof. G. G. Georgeson, College Station; Indian Territory, — Forman, Muskogee.

Eighth District—Colorado, Prof. E. E. Edwards, Fort Collins; New Mexico, ———; Arizona, ———; Utah, Mr. J. E. Johnson, St. George.

Ninth District—California, Prof. Robert E. C. Stearns, Berkeley; Nevada, ———; Oregon, Mr. J. B. Dufur; Washington Territory, ———; Idaho, ———.

Tenth District—Quebec, Mr. Wm. Little, Montreal.

Eleventh District—Ontario, Mr. D. W. Beadle, St. Catherine's.

Recording Secretary—W. L. DeBeck, Cincinnati, O. **Corresponding Secretary**—D. D. Thompson, Cincinnati, O. **Treasurer**—Geo. W. Trowbridge, Glendale, O.

The following persons present, enrolled their names as members, and paid their dues:

John A. Warder, North Bend, O.
Geo. W. Trowbridge, Glendale, O.
J. T. Stewart, Peoria, Ill.
Leo Weltz, Wilmington, O.
J. L. Teal, Perin's Mills, O.
Geo. W. Campbell, Delaware, O.
D. W. Beadle, St. Catherine's, Ont.
W. Brown, Ag. College, Guelph, Ont.
Horace Wilson, Columbus, O.
Wm. Saunders, London, Ont.
Geo. B. Loring, Salem, Mass.
Wm. Kramer, Dayton, O.
J. S. Hicks, Roslyn, Queens Co., N.Y.
Wm. R. Lazenby, Columbus, O.
Chas. J. Meyer, Fond-du-Lac, Wis.
Wm. Little, Montreal, Canada.
Charles Anderson, Kuttawa, Ky.
Cassius M. Clay, White Hall, Ky.
James Little, Montreal, Canada.
Alfred Springer, Cincinnati, O.
Geo. Vasey, Washington, D. C.
Samuel R. Lowry, Huntsville, Ala.
Vol. M. Spalding, Ann Arbor, Mich.
John H. Studer, Columbus, O.
A. W. Gilbert, Ross, O.
Chas. Mohr, Mobile, Alabama.
John G. Cullmann, Cullmann, Ala.
Bernhard E. Fernow, Lehigh Furnace, Slatington P. O., Penn.
Henry O. Stout, Adams Co., O.
John R. Proctor, Frankfort, Ky.
J. Taft, Cincinnati, O.
Franklin B. Hough, Lowville, N. Y.
C. C. Andrews, St. Paul, Minn.
Jonathan Periam, Chicago, Ill.
N. S. Townshend, Columbus, O.
Chas. Smith, Columbus, O.
E. H. Calkins, Burlington, Iowa.
A. R. Crandall, Lexington, Ky.
G. Bambach, Ripley, O.
J. Jenkins, Winona, O.
Edward Orton, Columbus, O.
Jerome Tice, Elenor, Clermont Co., O.
D. D. Thompson, Cincinnati, O.
N. H. Egleston, Williamstown, Mass.
C. E. Thorne, Springfield, O.
A. Furnas, Danville, Indiana.
H. R. Geiger, Springfield, O.
S. D. Bear, Dayton, O.
S. Bock, Miamisburg, O.
John Wm. Sohn, Hamilton, O.
George Dana, Belpre, O.
A. W. Butler, Sec. Society Natural History, Brookville, Indiana.
Cleveland Abbe, Army Signal Office, Washington, D. C.
O. M. Myricke, Brookville, Ind.
F. L. Harvey, Fayetteville, Ark.
J. W. Starr, Steele City, Neb.
John Simpkinson, Cincinnati, O.
G. B. Brackett, Denmark, Iowa.
W. L. DeBeck, Cincinnati, O.
Robert Kuehnert, Cincinnati, O.
Harman Dean, Sidney, Shelby Co., O.
R. B. Warder, North Bend, O.
Rev. John M. Walden, Cincinnati, O.
James W. Gamble, Cincinnati, O.
John P. Bennett, Pickaway Co., O.
Adolph Leue, Cincinnati, O.
D. C. Burson, Topeka, Kan.
T. E. MacNamara, Cincinnati, O.
Robert Clarke, Cincinnati, O.
C. G. Comegys, M. D., Cincinnati, O.
Jos. W. Miller, Cincinnati, O.
Jos. F. Wright, Cincinnati, O.
John A. Gano, Cincinnati, O.

The meeting resolved itself into four sections, and chose officers as follows:

Section A—"*Uses of Forests.*"

President—Franklin B. Hough, Chief of Forestry Division, Department of Agriculture, Washington, D. C.
Secretary—William Little, Montreal, Province of Quebec.

Section B—"*Conservation and Practical Forestry.*"

President—John A. Warder, North Bend, Ohio.
Secretary—S. W. Emery, Lake City, Minnesota.

Section C—"*Influences.*"

President—Prof. William Saunders; London, Ontario.
Secretary—Prof. R. B. Warder, North Bend, Ohio.

Section D—"*Education.*"

President—N. H. Egleston, Williamstown, Massachusetts.
Secretary—Prof. Adolph Leue, Cincinnati, Ohio.

The following named papers were entered, and for the most part read during the meeting, Nos. 1 to 15 being assigned to Section A; 16 to 23 to B; 24 to 30 to C; and 31 to 40 to D. The remainder were not classified, and some of them were read only by titles:

1. The Forestry of the Future,......*Franklin B. Hough*, Chief of Forestry.
2. The Southern Pine,................ ....*Dr. Charles Mohr*, Mobile, Ala.
2. The Walnut Tree,.......................... .....*Wm. H. Ragan*, Clayton, Ind.
4. Distribution of Canadian Trees,...*A. T. Drummond*, Montreal, Canada.
5. Flora of the Black Hills,......................*Robt. Douglas*, Waukegan, Ill.
6. Pine Forests of Canada,.........................*Jas. Little*, Montreal, Canada.
7. Arboreal Flora of Arkansas,......*Prof. F. L. Harvey*, Fayetteville, Ark.
8. Profitable Trees for Florida,..............*Hon. J. G. Knapp*, Limona, Fla.
9. Forests of Michigan,..............*Prof. V. M. Spalding*, Ann Arbor, Mich.
10. Forest Reserves at the Headwaters of the Ohio,..*M. C. Read*, Hudson, O.
11. Roadside Planting for Utility,......*Chas. Garfield*, Grand Rapids, Mich.
12. Trees of Texas,.......................................*T. V. Munson*, Denison, Texas.
13. Suggestion Regarding Government Assistance,
Prof. Wm. Brown, Guelp, Ont.
14. Historical Sketch of the Development of the Forest Policy in Germany,................*Bernhard E. Fernow*, Lehigh Furnace, Penn.
15. Preservation of Timber,..................*Prof. F. W. Clarke*, Cincinnati, O.
16. The Work of Western Nurserymen, Present and Prospective,
S. W. Emery, Lake City, Minn.
17. Culture and Management of our Native Forests,
H. W. S. Cleveland, Chicago, Ill.
18. Three-Motion Plan of Planting,.........*Robert Douglas*, Waukegan, Ill.
19. The Wild Cherry Tree, ...*Hon. Horatio Seymour*, Utica, N. Y.
20. Useful Trees of Michigan,................*Prof. W. J. Beal*, Lansing, Mich.
21. The Catalpas,............... ....*J. C. Teas*, Carthage, Mo.
22. Cheap, Hardy Trees for the Prairies,............*J. T. Allan*, Omaha, Neb.
23. Woody Plants of Ohio,.........*D. L.* and *Jos. F. James*, and *Dr. Warder*.
24. Forests and Health,....... ....*Dr. Daniel Millkin*, Hamilton, O.
25. Climatology and Forestry,......... *Dr. George L. Andrew*, Laporte, Ind.
26. Forestry and Rainfalls,..................*A. Saunders Piatt*, Mackacheck, O.
27. Torrents and Torrential Floods,.........*D. D. Thompson*, Cincinnati, O.
28. Evils of Woods Pasture,...............*Dr. J. A. Warder*, North Bend, O.

29. Droughts, Famines, and Floods in China, *David H. Baily*, late Consul General of the U. S. in China.
30. Forests and Rainfall in Ontario,..........*Prof. Wm. Brown*, Guelph, Ont.
31. The Necessity for a School of Forestry in the United States, *Gen. C. C. Andrews*, St. Paul, Minn.
32. What is a Forest Tree in the Eye of the Law? *Geo. C. Brackett*, Lawrence, Kan.
33. Management and Culture of the Locust,....... *Waldo F. Brown*, Oxford.
34. Measures of Locust Trees,...............*Dr. J. A. Warder*, North Bend, O.
35. Culture of the Locust on Long Island,......*John S. Hicks*, Long Island.
36. Educational Means,..........................*B. O. M. DeBeck*, Cincinnati, O.
37. A Suggestion from the Schools of Bavaria, *Prof. R. B. Warder*, North Bend, O.
38. Forest Administration in Germany,......*Robert Kuehnert*, Cincinnati, O.
39. Lessons from Australia and Scotland,...*Prof. Wm. Brown*, Guelph, Ont.
40. Suggestions Respecting a Text-Book on Forestry,.....*Prof. Wm. Brown.*
41. Advantages Resulting from the Preservation of Forests,...........*Baron Richard von Steuben*, Royal Chief Forester of the German Empire.
42. Forestry in America,...................................*Isaac Smucker*, Newark, O.
43. Forests and Trees of Northern Georgia,.*H. C. Freeman, C. E.*, Elijay, Ga.
44. Woods of Indian Territory,.........*J. Foreman*, Muscagee, Indian Ter.
45. Growth and Destruction of Forests, *Dr. A. G. Humphreys*, Galesburg, Ill.
46. Climatology and Forestry,.....................*Prof. Ingersol*, Lafayette, Ind.
47. Trees of Southern California,........... ... *Wm. Heaver*, Los Angeles, Cal.
48. Complaint of Diana—Poem,.................*Horace J. Smith*, Nordoff, Cal.
49. Why should we Plant Trees?.....*Dr. A. Eby*, Seringville, Ontario, Can.
50. The Poplars and Cottonwoods,...*Prof. Sereno Watson*, Cambridge, Mass.
51. Tree Planting,...................................*Simeon Eby*, Lancaster, Penn.
52. Wind-Breaks on the Prairies,...............*C. E. Whiting*, Whiting, Iowa.
53. Beneficial Effects of Wind-Breaks,...............*L. B. Wing*, Newark, O.
54. State Commissioners and State Arboreta, *Prof. W. R. Lazenby*, Columbus, O.
55. Timber in Illinois,.......................................*G. W. Minier*, Minier, Ill.
56. Trees Growing upon the Plains of Colorado—How influenced by Climate, Altitude, and Irrigation,......*D. S. Grimes*, Denver, Col.
57. Nature's Plan for Reproduction,................*Leo. Weltz*, Wilmington, O.
58. Natur Verjungung,..........................*Prof. Adolph Leué*, Cincinnati, O.
59. Colorado Hardy Conifers in Cultivation,...*Thos. Douglas*, Waukegan, Ill.
60. Colorado Conifers in Eastern Nebraska,..*J. Masters*, Nebraska City, Neb.
61. Experiments in Planting on Cape Cod,......*James S. Fay*, Boston, Mass.
62. Wald Verwusting, Wald Erhaltung, Kunstliche Bewalding, *K. Ludloff*, Milwaukee, Wis.
63. Wind-Breaks on the Prairies,.................*Suel Foster*, Muscatine, Iowa.
64. Pines of New England,.........................*John Robinson*, Salem, Mass.
65. Grouping in Forestry,...... ....*Dr. J. A. Warder*, North Bend, O.
66. Sylva and Plantations of Nebraska, *Gov. R. W. Furnas*, Brownville, Neb.

67. Nurse-Plants in Forests,..................*Dr. J. A. Warder*, North Bend, O.
68. Evergreens on the Prairies,..................*Samuel Edwards*, Mendota, Ill.
69. Planting by Railroads,........................*Robert Douglas*, Waukegan, Ill.
70. Iowa's Work in Tree Planting,.............*Prof. J. L. Budd*, Ames, Iowa.
71. Cheap Trees as a Shelter for Better Kinds, *Dr. J. A. Warder*, North Bend, O.
72. Mixed Plantations,...... ....*Dr. J. A. Warder*, North Bend, O.
73. Native Stock for Prairie Planting,...*George H. Wright*, Sioux City, Iowa.
74. Anti-miasmatic Influences,...............*F. L. Olmstead*, Brookline, Mass.
75. Lessons to be Learned from the Forests of Western Asia, *Prof. H. S. Osborn*, LL. D., Oxford, O.
76. Injurious Insects, ...*Prof. C. V. Riley*, Washington, D. C.
77. Forest Insects,..............................*Prof. Wm. Saunders*, London, Ont.
78. Arnold Arboretum,...... ....*John Robinson*, Salem, Mass.
79. Experimental Forest Stations,......... ......*Prof. A. Leué*, Cincinnati, O.
80. Trees of Worship among the Ancient Greeks, *Prof. Edward North*, Clinton, N. Y.
81. Romance of Forests,.....................*Gen. Durbin Ward*, Cincinnati, O.
82. Distribution of Conifers in the United States, *Dr. Geo. Vassey*, Washington, D. C.
83. The Cultivation of the White Mulberry,...*S. R. Lowery*, Huntsville, Ala.
84. Profits of Durable Trees,......... ....*Dr. A. Furnas*, Danville, Ill.
85. Forests and Water Supply,..............*Verplanck Colvin*, Albany, N. Y.

The following Committees were appointed:

1. *To report upon Forest Experimental Stations.* Prof. A. Leue; M. V. Colvin; Dr. F. B. Hough; Dr. Charles Mohr; Mr. D. W. Beadle; Dr. J. A. Warder, and Prof. William Saunders.

2. *To memorialize State Legislatures upon the establishment of State Forestry Commissions.* Dr. F. B. Hough; Prof. Wm. R. Lazenby; Prof. C. S. Sargent; Dr. J. A. Warder; Prof. Wm. J. Beal; Hon. Cassius M. Clay, and Prof. J. M. Safford.

3. *To report upon Forest Fires, and the Injuries to Forests by Cattle.* Dr. Charles Mohr; Mr. N. H. Egleston; Mr. Henry C. Sigles; Prof. R. C. Kedzie; Hon. Horace Wilson; Mr. V. Colvin; Hon. H. G. Joly, and Prof. Wm. Brown.

4. *To report upon best Methods of Planting.* Mr. A. W. Butler; Mr. J. Jenkins; Hon. L. B. Hodges; Dr. A. Furnas, and Mr. Thomas Douglas.

5. *To report upon Forestry Education.* Gen. C. C. Andrews; Prof. A. Leue; Prof. V. M. Spalding; Mr. Bernhard E. Fernow, and Prof. R. B. Warder.

After resolutions of thanks to the citizens of Cincinnati, for the efficient manner in which they had originated this meeting, and had arranged its details in a most satisfactory manner, the Forestry Congress adjourned to meet in the city of Montreal, upon the 21st and 22d days of August next, these being the days preceding the beginning of the meeting of the American Association for the Advancement of Science, as already appointed. Before adjournment, hope was expressed that Congress would be found willing to order the publication of the papers presented at this meeting. A series was prepared, and forwarded to Washington, and much correspondence ensued. The measure was considered favorably by the Printing Committee of the Senate, but the session adjourned without further action being taken.

We can not but regard this Convention at Cincinnati as destined to result in great and lasting benefit to the country, from its having awakened public attention to the great importance of Forestry, in the welfare of the present and the future. It attracted the notice of active minds, which had not previously realized the dangers that might result from excessive exhaustion of our forest supplies, and the neglect of measures tending to their renewal, and it brought together, from every part of the country, men who had taken a deep interest in the subject, and who independently, and each in his way, had been looking upon this question as urgently needing attention. It made them acquainted with one another, and in the discussions that occurred, every one of them gained some new ideas upon the subject in which they felt a common interest; and in the formation of a society that gave an organization to their efforts, a new impulse was given to the measure that can not fail to lead to the most important results.

A second meeting of this Congress has been held at Montreal, pursuant to adjournment, and with complete success. We hope in our next number to give an account of its proceedings, not having at hand, at the time of writing, the papers necessary for presenting a full account.

MISCELLANY.

On the Starting of a Maple-Grove for Sugar-Making.—In noticing the facility with which a maple orchard may be started, and the profit that may be realized from the investment, the Hon. H. G. Joly, in an official report made to the Dominion Government, thus speaks of the methods that may be practiced in Canada:

"There are, on almost every farm, spots where trees might be planted with advantage, without interfering with farming operations. Maple recommends itself, for the splendid quality of its wood, and especially for the profits yielded by it every year, in the shape of sugar. Farmers who are industrious enough to plant them, generally plant them too large, under an erroneous impression that they will, thereby, gain time. They are at a great deal of trouble and expense in selecting them and getting them out of the woods and planting them with extra precautions; large trees require strong staking to steady them against the winds, etc. Those trees, with their large roots broken, their rootlets torn, suddenly removed from the shelter, under which they were born and have always grown, are exposed to die in great number; the survivors linger for years before they can recuperate enough to go on with their growth; all this is rather discouraging.

"A cheaper way to raise a maple orchard is this: In the fall, after a heavy rain, if you go to any maple grove, you will find that the maple seedlings, with which the ground is covered, as with a thick carpet, will pull up as easily as carrots, with scarcely any damage to the little rootlets; in one hour you can collect hundreds of them, if the ground is sufficiently wet and soft.

"Plant them at once, in a corner of your garden in good mellow ground, about two feet apart each way, if you can dispose of that much room; you can put at that rate, nine thousand two hundred and sixteen seedlings in one superficial acre,—a fine nursery sufficient to supply trees for fifty-seven acres of maple orchard; for the wants of a farmer a little corner of his garden will be sufficient. Weed two or three times during the summer with a light hoe; it will mellow the ground, at the same time, and as the little trees grow up, prune them into good shape.

"In four years they will be fit for transplanting, about an average height of five feet, and the thickness of a man's thumb. Out of one hundred and fifty of those maple seedlings, treated as I have just described, I did not loose one from any other cause but the gnawing of the bark by field mice in winter, which killed about half a dozen, and that can be provided against by trampling the snow round the stems, when it is damp.

"Of course, in those four years they have grown much more rapidly than if they had remained in the woods choking one another, but that forced growth does not appear to weaken them. There is no trouble nor loss in transplanting; their roots do not run under those of big trees as when you take them full grown, out of the woods; there are no stones nor stumps to interfere. You can lift them up tenderly, and with a good sized ball as you dig a regular ditch in the soft ground parallel with the first row, and take them up from underneath, one by one, and row by row.

"I think they will soon overtake and pass maples raised and planted ten or twelve feet high. I can not, as yet, assert this as a fact, as my experiments are of too late a date; but there are strong grounds for expecting that it will be so, because they are accustomed to dispense with the shelter afforded by the large forest trees, and they are so little hurt by the safe way in which they have been transplanted, that their growth is very little checked, while the growth of a large tree is seriously checked by transplanting, if the operation is not carried on with more care and expense than our farmers can afford."

The Durability of Surveyor's Marks upon Trees.—The Joint Commission appointed under the Treaty of Washington of August 9, 1842, in referring to the line run from the Connecticut River to the St. Lawrence at St. Regis, gives some information, concerning the permanence of marks upon timber, and the value of the rings of growth in determining the age of trees:

"The line of Valentine and Collins was explored and found by the blazes still remaining in the original forest. Upon cutting into these blazes, it was seen, that, deep-seated in the tree there was a scar; the surface of the original blaze slightly decayed; and, upon counting the rings (which indicate each year's growth of the tree), it was found that the blazes dated back to 1772-'3 and '4. The line of Valentine and Collins was run in 1771-2-3 and '4. The coincidence of the dates of the blazes with those of the above line, confirmed by the testimony of the people of the country, satisfied the undersigned that the line they had found was that mentioned in the treaty."

Vandalism in the destruction of Trees.—A correspondent writing from Florida says:

"I regret to say, that I find in this state, not only great ignorance, but total indifference to the subject of Forestry. This is manifested from the peculiar enactments in the supposed interest of stock-raising, and the universal practice of burning over every portion of the land, where fires can be made to run, each year. This is in striking contrast with the practice of Wisconsin, where penal laws were passed to punish firing the woods and prairies, while it was yet under a territorial government. The beneficial results of those enactments are seen to-day in that state. Another idea prevails here, and is openly expressed in words, and acts: Our valuable timber trees are only fit to be girdled and destroyed! On my own farm are twenty large live-oaks yet standing, which the vandal axe nearly twenty years ago, and while it was still public property, girdled. If those trees were now alive, I would not have them destroyed for ten dollars a tree. I could name many similar instances. The pines, the cypresses, and the red cedars have melted before the same vandalism; and state laws encourage the destruction. The North and West, the mountain regions, and the Pacific slopes have awoke in part, but the Southeastern States, see only trees in the way of cotton-growing; and the cry is *destroy them!*"

The Hemlock in New Brunswick.—Mr. Edward Jack, of the Crown Lands Department at Fredericton, N. B., in a letter describing the timber resources of that Province, in noticing the distribution of the Hemlock, says:

"I find that the great body of the hemlock trees stands on the gray sandstone of the coal-measures, but that the soundest hemlock, and that freest from shakes, stands among the granite bowlders. In Nova Scotia I have observed near Windsor, up the valley of the Avon, a very fine growth of hemlocks, which are long, clean, and smooth. The bark is thin, and the trees hold their growth very well. These stand on the granite formation."

Lectures on Rural Improvement.—We consider the work done by the Hon. B. G. Northrop, L. L. D., of Clinton, Connecticut, in the way of lectures upon Rural Improvement as worthy of especial commendation. We learn from a circular before us, that he has aided in organizing over one hundred and fifty associations, for the promotion of this important work, which has done a great deal in cultivating public spirit, in the way of village adornment, and sanitary improvement, and in so doing in enhancing the value o property that falls within these influences. Dr.

Northrop is a pleasing speaker, and because he is an enthusiast in this particular line, he is sure to create an impression favorable to his subject.

Possibility of Timber Culture on the Great Plains.—Mr. Geo. C. Brackett, Secretary of the Kansas State Horticultural Society, in a letter dated July 17, 1882, in mentioning a journey to Colorado, from which he had just returned, says:

"I would very much like to write up for a paper, a sketch of my trip, which was largely in the interest of the Forestry of Kansas; having spent over a week, visiting points throughout the Arkansas Valley, and the same along the U. P. Ry., on my return from Denver, but must defer such until some future time. Suffice it to say, that there is sufficient evidence found along the lines of my route, to encourage extensive planting of forest trees, and if the stockmen can be prevented from gobbling up these extensive plains, as at this time there is a strong disposition to do, if the government will permit,—time, with the rapid settlements being made, will yet clothe these Western Prairies with valuable forests. Every-where the Cottonwood takes hold and maintains a good growth, and I assume, that any section that will maintain the growth of any of our forest trees, thereby prepares the way for others to follow. Hence the Cottonwood being the successful tree, must be used as a nurse-tree, and in its protection and the conditions it effects, others will succeed. This is hypothesis based upon observations in other sections, and I believe sustained by facts in hand."

Shelter Belts.—The natural growth of timber in a dense forest being slender and crowned with foliage chiefly at the top, it presents when left by belts, or thin masses, in clearing, a powerful leverage upon the roots, and is most liable to injury from the winds. Hence it is better to start new trees, or if the opportunity offers, save young thickets properly thinned out, rather than to expect benefit from a belt of trees already grown to full maturity. This opening up by clearings and vacant spaces, is a cause of injury to forests that are being worked for lumber or tan-bark, that often leads to serious losses.

Why the City of Tuskaloosa, Ala., is called "The Druid City."—The Editor trusts that he betrays no confidence by giving the following extract from a letter dated March 29, 1877, from Mr. Thomas Maxwell of Tuskaloosa:

"Yours of the 19th is at hand, requesting to be informed if I could inform you, why the city of Tuskaloosa is called *The City of Oaks*, or *The Druid City*. Since we are strangers to each other, of course I am puzzled to guess how you came to write to me, on the subject, and it is likely you may be astonished to find that without egotism I may fairly claim to be the great cause of that christening. . . .

"Getting a wife, I needed a cage for the bird, and in 1842 bought a home in Tuskaloosa, around which for shelter and for shade, was a cluster of China-trees, (like most of the homes of that early day,—on account of their rapid growth) which were unsightly, and made an annual deposit of unwholsome fruit. Some two or three of my neighbors (being tired of it) having substituted the beautiful water-oaks of the neighboring swamps and forests, which seemed to be doing well, I did the same:—and went a step further, as mine was a retired part of the town, by taking the liberty of planting a row of the same in the middle of our wide streets. I urged the city authorities to plant three such rows in every street of our mile-square corporation, and the result is that we have now a mile-square, of deeply embowered, beautiful and charming residences, and delightfully shaded streets. They are now of the thickness of a man's body, and to that of a horse, and thirty to forty feet high. This being a university town, and the seat of a flourishing Ladies' Seminary, it is a literary place, and it was but natural that it should be called *the Druid City*, the oak being their sacred tree. To impress this idea on all within her borders, the writer, in May 1875, delivered before the Druid City Literary Club a little history of the Druids and their traditions, under the title of '*The King Bee's Dream*', and about the last copy is sent to you, as it seems pertinent to your question."

. . .

Natural changes in Timber-Growth.—As an evidence of the change in vegetation in a country, without the agency of civilized man, there were found many years since, in a peat-bog, near the Adirondack Iron Works, altitude about 1,800 feet, in Essex county, New York, five or six feet below the surface, several trunks of large oak trees, and an abundance of acorns, which from the description given by an observer, appear to have been those of the red-oak. There is at present no oak timber within perhaps fifty miles of this locality. The timber on the peat-swamp was tamarack, and on the adjoining dry land, the usual varieties of hard-woods, such as birch, beech, maple, etc.

Effects of Rapid Growth, upon the Quality of Timber.—As a general rule, the "soft woods" (poplars, willows etc.) are rapid in their growth, and in many other kinds, the rapidity of growth bears an inverse proportion to the solidity of the timber. There may be real or apparent exceptions to this statement, but the general fact however remains true. Mr. Shuttleworth, Conservator of Forests, in reporting from the Northern Division of the Bombay Presidency for 1871-2, in reference to experience upon this subject, says:

"In reports on Teak Plantations we frequently read, that the plantation of those seedlings have attained the greatest height in the shortest period of time, is considered the most flourishing and satisfactory. This is a mistake. It is very pleasing to the eye to see teak-plants growing tall with giant strides, but when they come under the axe, the result will not be considered satisfactory:—instead of a close even grain, the heart of the sapling will be found full of pitchy matter. Three or four years ago, I was called in to survey some teak rafters from the Madras Plantations supplied to Her Majesty's Dock Yard, Bombay. These rafters were 9 to 12 inches in girth, about 20 feet long, and remarkably straight, bearing outward evidence of rapid growth. I found them quite soft, full of pitch inside, and broke several of them across, by hitting one end on the ground. It is needless to say, that they were utterly worthless for roofing purposes, and for use where strength and toughness are required."

As an exception to the above rule, we find white-ash, elm, hickory and some other trees, when grown in the open fields as a second growth, very solid and firm; although the amount of yearly gain is large. Although rapidly-grown woods in all climates, may lack that solidity, strength, and durability, which are acquired by age, there are processes of impregnation that will in a partial degree supply these defects, as we have elsewhere noticed, in the preparation of the Maritime Pine.

Upon the difficulties that sometimes attend the Planting of new Forests in hot Climates.—The author of a Report on the Forest Department in several Provinces of India, remarks:

"It should be borne in mind, that in most parts of the country the success of tree-planting is very precarious, attended by much risk of failure, except where water for irrigation from rivers or canals is available. Water has under the ordinary conditions of soil and climate in India, been found essential to the establishment of young trees, and it is certain that, as a rule, well irrigation will be found too costly to answer for plantations, except in a few localities, where from its extreme scarcity, wood is likely to realize very high prices. Owing to this risk in the success of plantations, the policy of Government in fostering and preserving the existing forests, with a view to their natural reproduction, appears a correct one: it is often urged against it, that it would pay better to plant new forests in convenient localities, than to preserve the old ones, which are generally far removed from all great centers of demand and supply. Experience however, daily proves that, except in a few favored localities, no system of planting can vie, in an economic point of view, with what nature can do, when protected and left to herself."

The Island of Nantucket, off the coast of Massachusetts was heavily timbered with oak and hardwoods when first known, but the woodlands were cleared off to the last tree. About twenty-five years ago, a thousand acres or so were planted by planting-machines, with the common pitch pine of New England, and for a time the prospects were excellent. They have suffered considerably from insects and fires, the most disastrous of which was set by a careless smoker. Notwithstanding these accidents, these pine groves are some twenty, or twenty-five feet high, and present quite the appearance of a forest, of great density, and of uniform height. The seeds are scattered leeward by the wind, and self-planted trees cover the ground from forty to eighty rods eastward from the original plantation. If let alone, they would doubtless in time cover the whole area.

About five years ago, quite a plantation of larch was set, but it suffered severely by being whipped out in a storm, in one of the gales to which the island is much exposed. It had not received much attention when we visited it in the third year after setting, the ground having received no cultivation, and the young trees being mostly shaded out by grass and weeds.

In the town, the Sycamore, Maple, White Maple, Elm, Ailanthus, Platanus, Basswood, and other trees have in recent years been planted with success, and there can be no reason to doubt but that these and many more would thrive under proper care.

This island was originally settled by proprietors, who held the land in common, and cultivated where they pleased. When the fertility was spent in one field, a beginning was made in a new place, and this improvident tillage has gradually exhausted the soil over a considerable part. As those owning shares went away, without seeking a division, a considerable part is a common waste, of doubtless ownership, strikingly illustrating the folly of undertaking to manage land under joint proprietors, and with common rights. In some portions, however, where individual owners have unquestionable possession, this worn-out soil, under proper cultivation, is found to yield a generous return, proving that the whole needs but like treatment, to bring about a similar result.

As Irrigation may at times be intimately associated with tree-planting, the following items may be of interest. The rule for measuring water drawn from ditches, is defined by law in Colorado (*General Laws*, 1877, p. 927) as follows:

"Water sold by the inch, by any individual or corporation, shall be measured as follows, to-wit: Every inch shall be considered equal to an inch square orifice under a five inch pressure, and five inch pressure shall be from the top of the orifice of the box put into the banks of the ditch, to the surface of water; said boxes on any dot or aperture, through which such water may be measured, shall in all cases be six inches perpendicular inside measurement, excepting boxes delivering less than twelve inches, which may be square, with or without slides; all slides for the same shall move horizontally, and not otherwise; and said box put into the banks of ditch shall have a descending grade from the water in the ditch of not less than one eight of an inch to the foot."

"*How Farmers may grow Forest Trees from Seed.*"—This was announced as the subject of a "paper," at the recent Meeting of the American Forestry Congress, at Montreal, by MR. D. W. BEADLE, of St. Catherine's, Ontario, but when called upon, he gave the substance of his communication verbally. It embraces so many excellent thoughts, in a concise form, that we will endeavor to present them here:

It being an expensive business for farmers to buy trees from nurserymen upon a large scale, they would find it profitable to raise their own trees. For a nursery they should take a small piece of ground, and have it especially well prepared and manured. The seeds of the Elms, Maples, Ashes. Butternuts, etc., can be got in quantities almost any-where. It is important that they be perfectly ripe, and that they be planted fresh. If they ripen early, as do the Elms and Soft Maples, they should be started the same season, and they will be well started before winter. He exhibited in a flower-pot two young maples from this year's seed. The seeds should be only lightly covered, and they will sprout at once.

Seeds that ripen late may be kept till the next spring, by mixing with sandy soil and keeping slightly damp. The nuts, may be planted as soon as gathered, and may be frozen and thawed without injury; but if much exposed to these alterations, it would be best to keep till spring, care being taken to prevent them from molding, or becoming too dry. They may be kept on the ground, lightly covered with a sod. It is not necessary that they should freeze—the main thing is to prevent them from becoming dry. The nut-trees do best when planted where they are to remain. The other kinds may be left in the nursery till planted for permanence.

These remarks led to considerable discussion, and many questions were asked and answered, as one and another stated his experience and observation, as to the time of ripening of seeds, the modes of gathering, keeping and planting, and various practical subjects which the topic suggested.

A specimen of the Bald Cypress (*Taxodium distichum*), planted by John Bartram in 1480, in what was long known as Bartram's Garden, now Gray's Ferry, near Philadelphia, in 1876 measured 27 feet around the base, and 23 feet at a point four feet above the ground. It is about 125 feet high, and sends up the protuberances known as "cypress knees," abundantly from the roots, on one side where the soil was more humid than in other places under the tree.

Experiments on Fuel.—By MARCUS BULL.—The "Journal of the U.

S. Association of Charcoal Iron Workers," edited by John Birkinbine, the Secretary (152 S. Fourth st., Philadelphia), is reproducing the substance of a paper first read before the American Philosophical Society in April, 1826, and published by the author some time after, in a separate form. The value of these facts has lost nothing from the lapse of more than half a century, and it is a somewhat singular fact, that during this long period of active research in almost every branch of philosophical investigation, this subject has been so long allowed to rest, and this work been left as the best of its kind that the country has produced. There can be no doubt but that the calorific qualities of the same species of timber, would differ as materially as do their specific gravities, strength, durability, and other qualities.

What we most need in this line of investigation, is a carefully conducted series of comparative observations, showing how the same species may be influenced by the conditions and circumstances under which it grows, and an inquiry as to how far these effects are constant, and likely to be found under like circumstances. Unfortunately in Mr. Bull's experiments, he simply gives the names of his woods, without further specifications than what may be inferred by their weight. In the course of our journey a year since, we visited Professor Nördlinger, of Tübingen University, (Wurtemburg), who has doubtless done more than any other investigator in determining the structure and qualities of wood. He informed us that he was about to undertake an extended series of experiments upon the heating qualities of woods. His methods will doubtless be exact, and his results trustworthy.

This is a wide field for investigation, and it affords a fine opportunity for profitable study. It leads directly to the application of results in the production of charcoal, for metalurgical purposes and the manufacture of gunpowder, and taken in connection with the distilled products of wood that are now just beginning to acquire importance in the arts, it might afford the most profitable results, not only in a scientific, but in an economical point of view.

The Growth of the Black Walnut in Ontario.—This was the title of a paper read at the Montreal Forestry Congress, and prepared by Mr. Thomas Beall, of Lindsay, Ontario. After noticing the changes that had occurred in the public mind, within the last ten years, upon the subject of the coming scarcity of timber, and the need of effort not only to stay destruction but to plant for future use, the writer said:

"Judging from our present knowledge of the commercial value of the various kinds of timber best adapted to the climate, and much of the soil of Canada, the cultivation of the Black Walnut offers greater promise for a profitable investment in this industry than, perhaps, any other kind Notwithstanding the opinion which so generally prevails that it is not sufficiently hardy to withstand the extremes of our climate, recent experience has taught us that it can be successfully and easily grown throughout the greater part of the Provinces of Ontario and Quebec, and probably also of Nova Scotia and New Brunswick, where an alluvial and deep rich loamy clay soil can be found. Late springs and early autumnal frosts does not injure this, as it does some other varieties of our forest trees. I have known a late spring frost to destroy nearly every leaf on a row of these trees, and in two weeks after, the trees were clothed with a new foliage. The blossom buds were, however, destroyed, and consequently no fruit produced that season.

"I have never observed the foliage to be injured by any insect enemy excepting the red-hump caterpillar (*Notodonta coccinnea*), and only occasionally by it, and this tree does not suffer by the loss of its foliage, as many other kinds do. Some four or five years ago, at about this time of the year, one of my Black Walnut trees was completely stripped of its leaves by the caterpillar, and, to my surprise, the tree re-clothed itself with new foliage before the end of the season completely, that no difference could be observed in its general appearance, from others standing near it, that had not been injured. The following season this tree appeared to be as healthy as any other."

The writer further notices its ability to withstand injuries from pruning when young, and the vicissitudes of temperature which, under his observation, the tree had endured. Nearly all who had begun to plant in his neighborhood had succeeded fairly well, and with a good soil, the trees were fine, healthy and well developed. If transplanted in hard, dry, gravelly clay soils they had not succeeded.

Dr. John A. Warder, in remarking upon this paper, said, that the Black Walnut grew rapidly during the first years, but much slower after it attained a certain age. Under favorable circumstances a Walnut tree of fifty years' growth would measure two feet across the stump; but if brought into the market at that age, it would be found very unsalable and useful only for plain work, such as for chair-legs, and articles of that sort. Its chief character was its great value and beauty, which it gets only in centuries. He recommended the planting of Walnut trees with trees of other kinds that come to maturity earlier in the same time, so that some return could be had from the land at once. Although nothing would grow under the branches of the Walnut, they might grow up together.

Labels for Plantations.—Nothing can give greater interest to the plantation, especially of trees not indigenous, than neat and plain labels attached to the trees, giving their botanical and common names. Upon the trees on the grounds of Girard College in Philadelphia, we noticed, in 1876, the names upon slips of metal, perhaps German silver, the letters being punched out like a stencil plate.

At the Imperial Botanical Garden at St. Petersburg, they use oval porcelain tablets, with the names in black enamel—written in at the Institution, and sent to Germany to be baked. They cost from 10 to 15 kopeks (8 to 10 cents) each, and will last an unlimited time, unless broken. It occurs to us, that some advantage would be gained, by using enamel of different colors:—for example, Black, for *indigenous*; Blue, for *exotic*, etc. The fact as to whether hardy or tender and any other fact or circumstance might be noticed, or what would be better, a number might be added, referring to a description in a catalogue, where a full account of peculiarities and uses might be found.

In other instances, we noticed labels made simply of a strip of sheet zinc loosely hung upon the trees by a wire. The name was written in a black corrosive ink, and was very legible after many years exposure to the weather. A common lead pencil leaves lines upon sheet zinc that will last a considerable time.

Comparison of the French and the American Methods of Turpentine Production.—In a paper by M. Alexandre Léon, read before the French Association for the Advancement of Science in Bordeaux in 1872, the comparative qualities of French and American resincus products are thus stated:

"Formerly from the crude turpentine there was prepared, as now, the spirits of turpentine, and then the dry rosin of a reddish shade more or less transparent, and the black opaque pitch. These products were sold entirely in France. The spirits were worth from 50 to 75 francs the 100 kilogrammes, and the rosin varied, according to its transparency, from 8 to 12 francs the 100 kilog. in the markets of Bordeaux and Dax. America supplied the markets of Europe, with spirits better purified, and with rosin or colophene of a pale yellowish tinge, transparent, sometimes a little reddish, and shading down from these the darker shades that we produced. The War of Secession cut short this American importation, and the Landes all at once received orders from England, Belgium, Germany and Spain. In a few months, aided by the Hugues system, our manufacturers were able to produce the spirits as pure, and rosin as transparent as the American, and prices went up to 250 and 300 francs per 100 kilogrammes for the spirits, and 90 and 100 francs for the pale yellow grades of rosin, and to 40 and 50 francs for that of inferior grades. But science did nothing towards this:—the manufacturers stimulated by these prices, took more pains with their work—but now we still see them working in the same negligent way, and with a result proportioned to the care that is bestowed One will get much pale rosin, while another can not avoid some accident, and gets only the red. They all succeed best with the spring run, and after the middle of August, they all get a reddish tint, as if the rosin that flows in the heat of summer, or during the autumnal rains were subject to some inexplicable discoloration· Can not science aid us in this—either by avoiding the coloring, or by getting rid of the color, so that we can deliver to commerce the spirits always limpid, and *virgin rosin*, as they call the American?

"We have sent a Commission to America to study this question in its commercial and its industrial aspects, and we feel confident as to the former, that in view of the dearness of labor in America, and as the clearings render carriage to the sea-board more expensive, we have no fears that their products will again lower the prices, as they did at the end of the war, when an accumulation of three years was turned upon the market. As for the industrial question, we have nothing to learn from the Americans. They work in about the same way as we do, by routine, and the problem remains as much unsolved as before."

The Gaining Value in the Growth of Large Trees.—The intrinsic value of wood in a tree one year old may be nothing. It gradually gains with the size of the tree, because the larger sizes are applicable to more important uses. It has been estimated that the value of the annual growth of the oak, in France, advances at the following rates:

At 50 years old, the annual value is 10 centimes; at 100 years old, the annual value is 80 centimes; at 150 years old, the annual value is 2 francs; at 200 years old the annual value is 4 francs.

We had prepared a Bibliographical list of recent publications upon Forestry in Europe and America, and hoped to include, at least, the latter in this number, but are obliged to leave it out till the next. It is our intention to keep our readers informed of every thing that appears new, upon this subject, as it comes to our notice. We invite notes and queries, and concise statements of experience in tree-planting, and shall endeavor to present points of useful information upon this subject, as fully as possible.

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REMINISCENCES OF FOREIGN TRAVEL. (No. I.)

By the Editor of the American Journal of Forestry.

ON the 23d of July, 1881, the writer landed at Liverpool, with instruction from the Commissioner of Agriculture, directing him to visit the various countries of Europe, and inquire into matters relating to FORESTRY, and especially concerning SCHOOLS OF FORESTRY, and EXPERIMENTAL FOREST STATIONS, so far as could be done within a time that allowed of absence till the 1st of December of that year. He had also a passport from the State Department, as an agent of the Government of the United States. For several years he had been in personal correspondence with many of the persons whom he expected to meet, and with some of these correspondents appointments had been arranged, (a little indefinite as to time), tending to facilitate the objects of the journey.

Deeming it of the first importance that a route should be laid down, that would accomplish most within the limited time allowed, and knowing that the Rev. John Croumbie Brown, of Haddington, Scotland, had been over a part of the ground, and that he was familiar with all matters relating to Schools of Forestry, and other matters pertaining to the subject, we deemed it proper to seek his advice without delay. So without even stopping at a hotel in Liverpool, we took the first train of cars for Manchester, for a brief visit to an old friend from Northern New York, and proceeded from thence to Edinburgh. The only stop made on this journey besides this, was at *Melrose*, to visit the scene of Sir Walter Scott's literary labors, and some of the places that he had made of interest through the graphic descriptions of his pen. We know not how many souvenirs of his intellectual greatness cluster around this place, and its surroundings, at the Abbey and at Abbotsford. The adjoining woodlands doubtless contain many trees that were planted under his eye, and their whole arrangement bears evidence of his cultured taste; and close by the Abbey ruins, we noticed the grave of Thomas Purdie, "wood-forester" at Abbotsford, his humble and trusted servant, who had charge. The interest which Sir Walter Scott took in Forest-tree planting, was by no means limited to the adornments of his own estate. His special essays, aside from the kindly allusions to the subject in many places in his writings, bear evidence, not only of his zeal, but his intelligence in these matters, and he both by precept and practice, sought every opportunity to diffuse correct ideas upon this important branch of rural economy.

Upon finding Mr. B., he cheerfully consented to afford every aid in his power, and to allow a little time for thought, to mature his advice, he suggested that we might in the meantime improve the opportunity to visit some of the forests in Scotland that deserved particular notice, and especially those of the Earl of Mansfield, at Scone, near Perth, and of the Duke of Athole, at Dunkeld.

On the journey to these places, an opportunity was offered for spending a few hours at Stirling, and the time was divided between a visit to the Castle, and to the exhibition of the Highland and Agricultural Society, that was then just opening near that place. It was but three years short of a century, since that society had been organized; and for the last thirty years or more, Forestry has been one of the subjects that have received attention. It has published a great number of Prize Essays upon the subject, some of which are of strictly local interest; but many of them are valuable contributions to knowledge, and of interest wherever trees are planted, or forest-products are used.

Among the powers granted by a supplementary Royal Charter, in 1856, was the appointment of a Board of Examiners, and the giving of First and Second class Certificates in Forestry. No inquiries are made, as to *how* or *where* the knowledge was acquired. It is the business of the Examiners to receive candidates, who may apply, and to ascertain what they know, and to certify accordingly. To those seeking competent agents, it affords a guarantee that applicants bearing these certificate, are in fact competent for places, and to the candidates themselves, an opportunity of making their attainments known.

As for the Exhibition itself, it differed but little from our State Fairs. There was a general show of stock, produce, and implements in great variety—a plowing match, and the usual crowd of visitors—but with this difference, that certain days were made high-priced, to allow of more quiet to those who were willing to pay, while on other days a low rate of admission invited the humbler classes, and nothing else.

The City of Perth is beautifully situated on the Tay, in the midst of a richly-wooded district, and the road to Scone, about five miles distant, crosses a fine stone bridge affording a beautiful prospect of the town. It leads much of the way through planted and well-kept woodlands, and among them are many specimens of trees of remarkable size.

It was in this neighborhood that David Douglas, the botanist, to whom we owe so much as a pioneer discoverer in the flora of our Pacific Coast, spent his boyhood, and in this vicinity are now growing some of the trees that he first sent home in 1827. Some of the "Douglas Firs" of the first planting, are now nearly or quite a hundred feet high, and it is found that this species does remarkably well in the soil and climate of this part of Scotland.*

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* David Douglas was born at Scone in 1798, and was the son of a laboring man. Having received an education at the parish school, he served an apprenticeship as a gardener, and in 1818, at Valleyfield, had opportunities of viewing the garden of Sir Robert Preston, and had access to his valuable botanical library. He was afterwards employed in the Glasgow Botanical Garden, where his aptness in botanical science gained him the notice and favor of Sir William Hooker. He was recommended to the Horticultural Society of London, and was sent under their auspices to study and collect the forest flora of the Columbia river region. It was from his descriptions, that the scientific world got the first accurate knowledge of the wonderful resources of that coast, and from his collec-

Upon arriving at the house of Mr. Wm. McCorquodale, we found that he had but a few moments before been notified by Mr. Brown of our intended visit; but during our brief stay, we had scarcely an opportunity of more than glancing at the objects of forestal interest in this locality. He has since kindly transmitted an interesting account of the forests under his charge, and the methods of planting and management employed. He informed us, that forty-five years ago, he had been appointed as head-manager to the Earl of Mansfield, at the same time reserving the privilege of being permitted to assist other proprietors in the capacity of wood-surveyor, and that during this period, he had surveyed and reported on the future management of the woodlands of other owners, upon about 160 estates in Great Britain. His present charge includes over 8,000 acres, in six estates, with a qualified resident forester under his direction upon each.

He has about 600 acres of pure oak, with a slight mixture of coniferae, and various hard-woods, to give amenity to their appearance, and about 400 acres of various kinds of hard-woods, chiefly Beech, Ash, Elm, Plane, and Lime trees, with a slight mixture of Poplars, Mountain-Ash, Horse-Chestnut, Spanish-Chestnut, Elder, Birch, Walnut, Purple Beech, etc.

The coniferous plantations cover about 7,000 acres, of various ages up to 120 years. The great bulk consists of Larch and Scot's Fir, with quite a large amount of Spruce and Silver Fir. There is a considerable area of the newer coniferous trees, especially of the Douglas Fir (*Pseudotsuga Douglasii*), which promises to be the most profitable tree they have, the Larch excepted. His method of planting, we have described in our "Elements of Foresty," and will not here repeat. Among our Western conifers, there were fine specimens of the *Abies nobilis*, and of the *Pinus monticola*, the latter about fifty-four years old, and said to be the finest in Scotland,—the Menzies' Spruce (*Picea Sitchensis*), Sequoias, that promise well, and many other species from other regions, that here have found a congenial home.

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tions the first seeds that were received of many of the new species which he discovered and described. He afterwards visited the Sandwich Islands, where upon a botanical tour July 12, 1834, he fell into a pit which the natives had constructed for trapping wild cattle, and perished.

These woodlands are adjacent to the Royal Palace of Scone, where in the ancient time, the Kings of Scotland were crowned. "A hoary and honored antiquity throws its mantel around it, and its name is redolent of far by-gone days, when Royalty itself held high state within its even then ancient walls."

But "business before pleasure," was the motto of the journey, and without spending time to admire the rare beauty of the scene, within sound of the ceaseless rush of the Tay, or getting more than a glimpse of the glorious landscape through which that river runs, the distant Grampian hills, or the objects of historic interest that cluster around the place, we bade our coachman to return to Perth, and arrived in time to make a close connection for Dunkeld.

We were less fortunate there, for Mr. McGregor, the chief forester, had gone out to spend the day in a forest tour, only a few minutes before our arrival at his residence at Ladywell. The cathedral, partly in ruins, but still carefully kept from further decay, the adjoining gardens in which the Tyrolese Larches are still growing, which were the pioneers of their kind in Scotland, and a long tour with a guide, through some of the forests adjacent, afforded some subjects of interest, and opportunity for seeing a part of the woodlands for which the estate of the Duke of Athole is so widely known.

Were it not for the disease that has in recent years appeared in a part of the Larch forests of this region, this timber would be by far the most valuable that could be grown.

As it is, many foresters now in starting plantations, plant the Larch (*Larix Europea*) and the Scotch Pine (*Pinus sylvestris*) in alternate places, and in about equal numbers. If the former appears to be perfectly healthy at the time of first thinning, it is allowed to stand, and the whole forest becomes Larch; but if otherwise, it is taken out, and the woodland grows up all Pine.

In the course of the tour through which visitors are usually conducted, is some exceedingly fine scenery in the way of cascades and ravines, and the place is an object of interest to tourists upon this account.

Returning to Edinburgh by the evening train, a day was spent with Mr. Brown, in visiting the Botanical Garden, and other places of interest, and in calling upon several members of the Scottish Arboricultural Society. They were to have their summer excursion in a very few days, and it was hard to forego the pleasure of accepting their invitation; but the plan that had been laid down, required us to take the steamer that evening, which crossed the German Sea to Christiansand in Norway, and to Copenhagen in Denmark; so without further delay, we took passage, as the day was closing, and were compelled to remain within, as the steamer departed in a heavy shower of rain.

LARCH-MERE.

Extensive Plantations on Waste Lands—Situation, Soil, Elevation, Exposure to Heat and Cold—Natural Growths—Nature's Methods of Shading the Lands—Pinus-strobus as an Illustration—Upland Plantations.

By Dr. JOHN A. WARDER, of North Bend, Ohio.

IN this age and country, where so much is accomplished by the assumption of merit, and by boastful claims of praise for works said to have been performed, but which too often fail when they are subjected to close scrutiny, it is truly refreshing, in our rambles over the country, to meet with a tree-planter who does not boast of millions as the result of his labors, which, when seen, will contain only a few thousands; and instead to find a man who, without any bragadocio, quietly and thoroughly does something that is worthy of notice and report.

Fast as trees may grow in this country, and their rate of increment is said to be much greater than in European forests, still the work of growing a productive forest that shall yield returns within the lifetime of the planter appears to most men problematic. Some fast-growing trees, like the Cottonwoods, Willows, Chestnuts, Locusts, and a few others, with very brief rotation, may be cited, but, as a rule, Forestry is and must be slow in its cash returns.

But to a brief description of Larch-Mere—where our worthy friend has undertaken to clothe a vast extent of waste, sandy land with valuable timber. Not content with the usual boast of so many who are styled Foresters and Forest-planters, who can show but a few acres at the most, we here find many hundreds devoted to this crop. The planting is of course progressive, and spread over several years, but it is done by a private citizen who has other interests to look after, and who must also provide for his daily wants.

From the great railway corporations, who possess larger means, and on account of their own deep interest in Forestry, that would enhance the value of their extensive landed estates, granted as subsidies by the government, we had expected, before this time, some grand results that would be worthy of record. But what have these wealthy bodies to show, after long years, as the result of the florid anticipations that were published to the world some years ago! Let them look to their laurels, or it may happen long before the close of the century, that private individuals of moderate means will have greatly outstripped them with absolute results of growing timber.

The plantation which is now to be described, is situated on the low shores of Lake Michigan, on its western coast, near the little city of Waukegan, Illinois, close to the Wisconsin State-line, in latitude 42° 30′ N., at an elevation of six hundred feet above the sea. The surface is slightly above the level of the lake, except where, from the continued action of winds and waves, the sands have been thrown into dunes of fifteen to twenty feet in height. The whole territory, extending for some miles along the shore, appears to be the delta of a small stream called Dead River, which here finds its embouchure after cutting its way through the elevated bluff of glacial clays that forms the original boundary of the lake, and rises thirty to forty feet above the water.

The surface of this extended plain, is made up of a succession of narrow, low, flat ridges, separated by shallow depressions, usually containing water—these are generally but a few rods wide, and their trend is parallel to the coast of the lake; they seem to be old shore-lines, like the higher ridges along Lake Erie in Ohio. At present there is little or no arboreal vegetation, though there are evidences of some ancient forest growth, and an occasional White-Pine tree still standing gives proof of an ability to produce trees. The dry ridges have a scanty covering of inferior grasses and other herbaceous vegetation, with here and there patches of shrubby growth, consisting of Bear-Berries, low Willows, Aspens, Cornels, Spireas, and on those more elevated are a few White Pines, with the more abundant but very scrubby Black-Oaks and some other trees and bushes, among which are Junipers, notably the trailing form of *Juniperus sabina*, and known as the "*Waukegan-Trailing*."

In many places, however, and wherever the herbaceous covering is disturbed and the surface is exposed to the action of the winds, particularly near the lake, broad areas are perfectly bare, and composed of drifting sands, that are thrown into dunes, and changed in form from year to year. The depressions between the ridges are clothed with native grasses on their sides, with Typha, rushes, and other aquatic plants where they are deeper and covered with water—here, of course, there are accumulations of vegetable debris, but the bottom is every-where firm sand. In these depressions, woody growth is rare, and consists of Button-Bush (*Cephalanthus*) and some Willows, until you reach the last depression under the bluff, where the Black-Ash of small size is found.

Such a tract of land would seem to be rather unpromising to the tree-planter; being on one part too wet for tree-growth, and on the other, composed of pure sand to receive the scorching rays of a midsummer sun and liable to reach a temperature of more than 100° Fahrenheit in the daytime, alternating with cold, at night, of perhaps 50°, as a result of radiation, and exposed to very low temperature with the trying winds of winter.

Notwithstanding the unpromising, even forbidding aspect, the natural indications were such as to encourage the attempt, which was made, and has been made successfully, to clothe this waste with a profitable crop.

Great encouragement was given to the enterprising planter by the results of his observations upon the plans Nature had adopted to enable the spontaneous growths to protect the sands from the baking heat and biting cold—and thus to secure a more temperate stratum of soil near the surface for the feeding roots of the trees. The scanty herbage of the grasses could do little in this way. The Trailing-Junipers, however, soon covered the surface and caught the drifting sands that formed cumuli about them—on other spots of the dunes a close carpeting of the *Uva ursi* concealed the sand, making it possible for tree-seeds to germinate and to survive the summer heats, and so the arboreal vegetation gradually spread over these ridges.

The most interesting forestal study here was the behavior of the *Pinus strobus* on these sands. Feeling the necessity for a cooler soil, the upward growth of the young trees was arrested, and the lateral branches were extended, quite near the surface, until, in some cases, they had reached a diameter of a rod or more, when at length an aspiring leader would shoot upward, and the growth of that tree was assured.

Planting, under such conditions, was a very simple affair. On the sand, the mark of wagon-wheels was sufficient. Furrows were plowed on the dry ridges and the trees were set either *in pits* or by *notching*, according to their sizes. The species selected are mostly coniferous—the common Pines and Larches prevail, while some Ailanthus and Catalpas were also planted. All seem to be doing well in their new homes, with some failures of course, in removal from the upland nursery-grounds to these flat sandy lands, and from the shelter of the close rows to their more scattered stations on the exposed hot sands, the transition was more than they could bear until nature provided the necessary shade by lateral branches as observed in the native *Pinus strobus.*

The Scotch Pines seem to have become reconciled the soonest to their new home, and grew off beautifully. The robust Austrian, promises well, but the *Pinus rigida* and Table-Mountain Pine, have not done so well.

A recent report from the plantation (July 29) is very satisfactory. "Many Scotch Pine, a few Austrian, and many White-Pines, are now eight to ten feet high—some Larches are twelve feet. Where the trees stand close, they run up about as fast as on good lands, but single trees have to spend some years in making laterals to shade the ground, and then they shoot upward. My Larch-Mere plantation is really a study."

The trees are exposed to inroads of teams, skating parties, cattle and fires, and yet "they are far ahead of those on Cape Cod or any other barren-land plantations I have seen. . . . If the Ailanthus would stand our climate, it would be the tree to cover all these wastes rapidly, and it would not be so liable to be burned as the Conifers. Of course Spruce, Balsam-Fir, Arbor-Vitæ, and Red-Cedar will not grow in blowing sand nor in any very sandy land, but the White, Red, and Scotch Pines will grow as rapidly here as in good upland without cultivation."

Here are six hundred acres of forlorn waste, marsh, and sands, that had furnished but a meager pasture of inferior herbage, which are now put in the way of producing a grand forest, by the planting of five hundred acres with timber trees.

The situation, too, is one that can not fail to attract the attention of travelers on the Chicago and Milwaukee Railroad, which courses along the base of the bluff, on the western side of the plantation, and commands a view across the flats.

Some forest trees planted on the upland are also worthy of note. A large nursery, well stocked with Pines and Larches, became unsalable by their size during a period of depression, and have now grown into a bit of forest covering twenty-four acres, and they show what the Larch can do on such land. They are already twenty-five to thirty feet high, and many of them three to seven inches thick at the base, and would be available for hop-poles, fencing, and for many purposes.

Having named the locality as at Waukegan, Illinois, it will be unnecessary to add the name, Robert Douglas & Son, familiar as household words to all western tree-planters, and known indeed in all civilized countries whither the public mails have transported so many of their dollar-packages of little or baby forest-trees, that have enabled men to gratify their desire to experiment in tree-planting, even in the uttermost isles of the sea, and upon the jungles of India, wherever civilization has sent the mail-bag have "these presents" gone as worthy pioneers of advancing and progressive American Forestry—a Yankee suggestion, and far-reaching as thought.

THE FORESTRY OF THE FUTURE.

By FRANKLIN B. HOUGH., PH. D.

(Continued from page 26).

THIS rapidly-grown wood, when cut before it has been hardened by age, would not last more than two or three years on the ground, as railway ties, or in the soil as posts and stakes; but when injected with the sulphate of copper in solution, they become not only very durable, but harder, stronger and less inflammable, the open pores receiving the solution perfectly throughout.

At several stations there are extensive establishments for preparing the wood by this process, and they can turn out 1,000,000 of ties a year.

Although France imports many grades of woods largely beyond her exports, still in 1880, she sent to foreign countries 25,000,000 of francs worth of wood-products, of which about half went to England, and much the largest part went out from the Gironde and was the growth of the Landes. In fact, hundreds of cargoes of these products are sent out yearly from Bordeaux, and for certain grades of coarse lumber, that city has become in recent years, the great commercial center of Southwestern France.

In 1857, a committee predicted that these plantations would add more than 1,000,000,000 of francs to the wealth of France, in a region the most sterile and forsaken. This seemed at the time the declaration of some wild enthusiast, or a scheme to advance the interest of some speculation. But this prophecy has been more than realized! In presenting this sketch, I speak of what I have seen. I have ridden for more than twenty miles among the Dunes which Brémontier and his successors planted, in company with an intelligent resident, who knew all about these forests, their history, and the economies that they serve. I have visited the establishments of which I have spoken, and examined their methods. I have passed and re-passed through the whole length of this forest which Chambrelent—still living and active—begun, and which he and others who got their impulse from him, planted.

Need I repeat, that in a long journey made for the express purpose of studying the forest-question, and which extended through almost every country in Europe, and embraced every subject in any way affecting the forest-interests of these countries, there was nothing that interested me more than this?

But I have not entirely finished what I wanted to say about the Dunes and the Landes. A turpentine-forest, like those on the Landes, is by no means a solitude. It requires a considerable local population for its attendance, and these laborers must have homes near their work. They must have gardens and lands for cultivation, and to get fertility, they must keep cattle to get fertilizers from stables. These forests are dotted all through with little plantations, that serve an actual benefit, by interrupting the continuity, and preventing sweeping fires, which have in former years proved disastrous, but are now quite uncommon. They still afford pasturage for stock, and quantities of herbage, bushes, and undergrowth are pulled up, pressed into small bales by powerful machines, and sent to Paris for oven-wood and other uses.

In all these operations, care is taken to maintain a growth of young timber to take the place of that which is cut, and the production, as we have described, may be indefinitely continued. The fevers that once infested these regions have disappeared with their cause.

I can not, however, pass this subject without noticing one other result, by quoting from an official report of the General Council of Gironde, which was drawn up from exact data. They say:

> "It was interesting to see how the spirit of improvement went forward, when once under way. In some of the Communes there were no conveniences for public business; they hired some mean apartment in a tavern for their occasional use. They had no schools, and the few old churches had fallen into ruin, so as to be wholly unworthy of use. But now, with the increased value of their lands from drainage and planting, the local Councils, under the advice of the Administration, having sold some of their land to secure these improvements, consented to part with still more to get the means for building public offices and buildings for schools and worship."

Without giving the exact details of all these, it may be stated, that they amount to almost two and a half millions of francs for churches, three-quarters of a million for priests' dwellings, a million and three-fourths for public offices and school houses, almost two millions for country roads, and another million for other improvements, such as filtering-wells for public use, the removal of village cemeteries to rural sites, and other matters of obvious utility, besides having nearly four and a half millions in their treasuries. The Council might well sum up this statement by saying:

> "This is one of the most beautiful pages in the history of civilization and progress—in a region that twenty years ago was one of the poorest and most miserable in France, but which may now be ranked as among the most wealthy and prosperous."

But I have wandered from my text, and must recall myself. It is embodied in the words, "extensive and judicious planting" and "effectual measure for economizing our remaining supplies."

Now, I understand that "extensive" planting means "a good deal of it." We have already seen that in the countries of Europe, where the subject is best understood, this is something more than a quarter of the whole area, devoted to the growth of wood.

Now, how many old-settled farms are there in the country that have this proportion of reserved or planted woodlands? How many are there that have cut off their last acre? How many the last tree? I would not inquire—how many farms could be found in the country, in which, under present management, the profit is now much below what it would be, if judiciously planted with trees?

It is a natural and noble instinct in man, to seek to promote the welfare of his family, and it is no mean motive in him to toil through life, in order that he may leave an estate for their inheritance. Now, if by careful management, a man can so improve his farm that it will be worth several times as much when he leaves it, as it would have been without this "judicious planting" that we are considering, is he not securing the very object of this laudable ambition?

But passing to a further notice of the precept of our text, there can be no other meaning in the term "judicious planting," than that founded upon a correct knowledge of the conditions and wants of the location. What is the capacity and quality of the soil? What are opportunities afforded by climate, altitude, aspect, the demands of available markets and other circumstances—and what species will best meet these requirements?

With respect to the kinds of trees that will grow to best advantage, in a region once timbered, there should be no difficulty in selecting from those that we know once flourished upon the soil, such as will be probably the most valuable when grown. There are doubtless other kinds that will flourish, and probably some that would be more profitable.

But when we find ourselves without this indication from past knowledge or present observation, the case becomes very different, and this brings me to a most important point for consideration: It applies to the settlement of the pioneer upon the prairies, and the plains, where there is no trace of what has been,—if ever, in the way of timber,—certainly nothing at present, and a matter of uncertainty as to what can be grown, if any thing, as forest trees. These pioneers are very often poor, or they may be young and inexperienced; or, what is still worse, they may have an experience gained under other conditions which they can not apply here, and which they must unlearn and begin anew. The latter class may have failed in attempting to apply their knowledge, and from this may settle down with the conclusion that nothing can be done, thus discouraging others in their own disappointment.

It is for these conditions that we may properly invoke the aid of Government in the establishment of Experimental Forest Stations for determining what can be done, and what can not; and as to the possible and the most profitable, and by what methods can we best avoid failure and insure success. These facts, when known, should be published for the information of the country.

In these researches, a negative may prove almost as valuable as a positive result, for when once known, there will be no losses or disappointments by repeating a trial that has uniformly proved a failure. Now, some of this information may be gained accidentally or experimentally by an individual, but it may not become known to others. There must be a centralized agency, for collecting, summarizing and diffusing the information. This is a most important question in Forestry, and one upon which I have given much thought, but as this is embodied in my Third Report upon Forestry; I will not further consider it on this occasion.

Time will not permit me to follow the subject implied in the term "effectual means for economizing our remaining supplies," with that detail that it deserves. So far as relates to the remaing supplies upon our public lands, after carefully studying the systems now in use, or in course of introduction in the English colonies of India and Australia, where the circumstances closely resemble our own, and the system of timber management in Canada, as very fully described in my Second Report, I have presented the conclusions with as much detail as was found practicable in the Third Report, and will not anticipate them here. As for remaining supplies upon lands held by individuals, they will in all cases be managed, or wasted, as the intelligence or the ignorance of the owners may lead them, or as their interest may guide. There are economies to be studied at every point, perhaps in nothing more notably than in those relating to fences, and the needless waste that they occasion. There are wastes in the working of timber and lumber that might be avoided—uses for parts now wasted—wants that are not real—and methods that need improvement.

Some of these may hereafter be forced upon our notice, as the prairie farmer learns to cultivate his land without fences; but it is better to anticipate and avoid these inconveniences by seasonably providing against them. *Do not hesitate to plant a part of the farm in timber trees.* If they are not needed on the place, they will always find a market. There will always be a growing demand for timber so long as the industries thrive; and should ever a time arrive when this demand can not be met, the effect must be felt through every phase of our civilization.

THE AMERICAN FORESTRY CONGRESS — MONTREAL MEETING.

PURSUANT to adjournment, the Congress met August 21, 1882, at No. 132 St. James street, which had been fitted up by Mr. William Little, Vice-President, who had been appointed at the previous meeting to make the arrangements needed, and who left nothing undone in rendering them complete.*

The first public session began at 2 P. M., and in the absence of the President, the meeting was called to order by Dr. Franklin B. Hough, and the HON. H. G. JOLY, of Quebec, was chosen Temporary President. The Secretaries not attending, Dr. F. B. Hough was chosen Temporary Secretary. The Treasurer having resigned, Dr. Charles Mohr, of Mobile, Ala., was temporarily appointed to that office.

A committee was appointed, consisting of Dr. Charles Mohr, Mr. Bernhard E. Fernow, and Prof. William Saunders, to confer with a committee appointed by the American Forestry Association, at Rochester, N. Y., in June last, upon the question of a union of the two organizations, whereupon the General Session adjourned to meet in sections, at which the following papers were read and discussed, some of them, in the absence of their authors, being read by the Secretaries:

SECTION A:—*Pres.*, F. B. HOUGH; *Sec.*, WILLIAM LITTLE.

1. Forest Fires.................................*Joseph S. Fay*, Wood's Holl, Mass.
2. The Distribution of Hardwood Trees in the Gulf Region of the Southern States....................*Dr. Charles Mohr*, Mobile, Ala.

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*We deem it an act of simple justice to Mr. Little, to notice the intelligent and successful manner in which these preparations were made, including a vast amount of correspondence, the use of a whole suite of furnished rooms at "Forestry Chambers," for the sessions of the Congress, the hire of "Queen's Hall" for two evenings, and all of the printing needed before and during the meetings. He also secured the printing of a large edition of two numbers of the "*Montreal Herald*," making in all sixteen folio pages, exclusively devoted to these proceedings. For these expenses, no claims were presented to the Society, and no aid was asked from his fellow citizens. Very many of the members attending were also placed under personal obligations to him, for aid in securing accommodations at a time when the hotels were crowded, and for other attentions that strangers can not readily secure.

3. Tree-Planting by Railroad Companies, *Dr. Franklin B. Hough*, Lowville, N. Y.
4. The Rational Method of Tree-Planting, *N. H. Egleston*, Williamstown, Mass.
5. The Russian Mulberry............................*D. C. Burson*, Topeka, Kan.
6. The *Larix Europea*, (European Larch); its quick Growth, Adaptability, Propagation and Culture..*David Nicol*, Cataroqui, Ont.
7. The Coppice for the Village and the Town.......*M. C. Read*, Hudson, O.
8. Forest Trees most suitable for Streets, Lawns and Groves, *J. Beaufort Hurlburt*, Ottawa, Ont.
9. The Destruction of Forests, and Tree-Planting, *John Dougall*, "Edr. N. Y. Witness."

SECTION B:—*Pres.*, DR. JOHN A. WARDER; *Sec.*, HON. E. H. SPRING-RICE.

1. Tree-Planting for Railroads...........*Dr. John A. Warder*, North Bend, O.
2. Remarks on the Canadian Cultivation of the *Catalpa speciosa*, *Robert Burnet*, Pictou, Nova Scotia.
3. Experiments in Tree-Planting on Cape Cod, *Joseph S. Fay*, Holmes' Holl, Mass.
4. The "Three-Motion" Plan of Planting,*..*Robert Douglas*, Waukegan, Ill.
5. Planting on the Plains..........................*H. M. Pennel*, Russell, Kan.

SECTION C:—*Pres.*, PROF. WM. SAUNDERS; *Sec.*, REV. THOMAS S. FYLES.

1. The Commercial Value of Pruning..........*John S. Hicks*, Roslyn, N. Y.
2. Apology for the Pioneers...................*John W. Caldwell*, Cincinnati, O.
3. The True and the False in Arboriculture.........*William Robb*, Montreal.
4. Some Notes and Remarks on the Denudation of our Forests, *G. L. Marler*, Montreal.
5. How the Forests of the Eastern Townships were Broken Up; a Brief History.......*Rev. Thomas S. Fyles*, Cowansville, Quebec.

On Monday evening, August 21st, pursuant to public notice, a meeting was held at *Queen's Hall*. Cards of invitation, elegantly printed upon thin lamina of wood, had been issued in great numbers, and the attendance was large.† His Honor, MAYOR BEAUDRY, presided, wearing the insignia of his office, and after a few words of Welcome, introduced the HON. HENRY. G. JOLY, who delivered an Address.

He was followed by DR. FRANKLIN B. HOUGH, who delivered an address of some length, upon the general subject of Forestry. After a few remarks by Mr. D. W. Beadle, the meeting closed.

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*This paper had been read by title, at the Cincinnati Meeting.

†The platform was decorated for the occasion with rare plants in bloom, and conspicuously behind the President's chair was the legend, "Woodman, spare the Tree." On either side were shields inscribed, "American Forestry Congress, 1882," surrounded by American and English Flags entwined. While the audience was assembling, a selection of music was played by the City Band.

Proceedings of the Second Day: *August* 22*d*, 1882.

The Forestry Congress met in general session, the Hon. H. G. Joly presiding: Prof. Saunders, from the committee appointed the day previous, presented the following resolutions, which were adopted:

" *Resolved*, That whereas, in the year 1875, an Association was formed, under the title of 'The American Forestry Association,' having for its objects the collection and disseminations of information of the subject of Forestry, and the awakening of an interest in the public mind, of which Association Dr. John A. Warder, of Ohio, was elected President:

"*And whereas*, That Association, especially through the labors of its president, who has been most untiring in his efforts, and has spared neither time nor means, in the zealous prosecution of his labors for the advancement of the Science of Forestry, has been an important agency in calling into existence the Society known as 'The American Forestry Congress':

"*And whereas*, The American Forestry Association is desirous of uniting with the American Forestry Congress, and thereby forming one Society for the prosecution of the objects common to both:*

" Therefore, this committee of Conference hereby recommends that the present members of the American Forestry Association, be received as members of the American Forestry Congress, and that the Funds in the Treasury of the American Forestry Association, be applied in payment of its own expenses."

Mr. D. W. Beadle introduced a resolution, which was adopted, declaring that this meeting shall be regarded as the first in the history of the Association in its present form, and that those uniting at the present time, shall be considered as original members of the Organization.

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*We follow the language of the resolution. Dr. Warder remarked, " that he had come here prepared to co-operate with this Congress, and to submit to whatever the committee would recommend. The Association has done a great deal of good during the last seven years, but they were even prepared to abandon their organization, if necessary, to advance the interests of American Forestry."

Mr. B. E. Fernow offered a resolution, which was adopted, directing the Chairman to appoint a committee of five to revise the Constitution, which had been found defective, so as better to adapt it to the wants of the Congress. The Chairman appointed Mr. Bernhard E. Fernow, Dr. Franklin B. Hough, Dr. John A. Warder, Mr. William Little, and Dr. Charles Mohr, as this committee, and requested them to report on the following day.

The following paper was by resolution taken from the printed programme, and read in general session: "A few Practical Remarks from the Lumberman's Stand-point," by *J. K. Ward*, Montreal.

The reading of this paper led to a discussion upon the subject of Forest Fires,—in the course of which, Dr. Geo. B. Loring, the President, appeared, and took the Chair.

Dr. Charles Mohr, chairman of a special committee appointed at the Cincinnati Meeting, to report upon the subject of Forest Fires and Injuries from Cattle, then read a report, which was filed. This led to a discussion, in which the Hon. Peter White (M. P. Dominion Par.), Mr. Eleazur Wright, of Boston, Hon. Geo. Bryson (Legislative Council, Prov. Que.), Hon. H. G. Joly, Mr. John Dougall, Mr. W. R. Thistle, of Ottawa, Mr. King, Mr. Larkin, and Mr. J. K. Ward, participated.

A resolution was then passed, declaring it the duty of this Congress to draw earnestly the attention of Governments to the necessity of protecting effectually the public forests against fires, and the following persons were appointed to carry this resolution into effect, viz: Hon. Peter White, Mr. J. K. Ward, Dr. Chas. Mohr, Mr. Geo. Bryson, Dr. F. B. Hough, Mr. B. E. Fernow, Mr. H. G. Joly, Mr. Wm. Little, Prof. C. A. Sargent, and Mr. E. D. Baker.

It being apparent that time could not be allowed for reading all the papers upon the programme, Dr. Hough, Dr. Warder, Mr. Little, and Mr. Beadle were appointed to select such as should be presented in the afternoon session.

Afternoon Session: August 22d, 1882.

Upon assembling after a recess, the President delivered his annual address. The following papers selected by the Committee, were then read in general session:

How Farmers may Grow Forest Trees from Seed, *D. W. Beadle*, St. Catherines, Ont.
On the Growth of Black Walnut Timber in Ontario, *Thomas Beall*, Lindsay, Ont.
The Ash……………… *Arthur Bryant*, Princeton, Ill.
Extensive Planting of Shelter-Belts…*H. M. Thompson*, Preston Lake, Dak.
On the Growth of Black Walnut Timber in Ontario, *Thomas Beall*, Lindsay, Ont.
Forestry from a Hygienic Stand-point……… *Dr. Henry Howard*, Montreal.

During the discussion that ensued upon the reading of this paper, the President withdrew, and the HON. H. G. JOLY resuming the Chair, presided until final adjournment.

On the Growth of Poplar Trees for the Manufacture of Paper and Charcoal……… *Prof. William Saunders*, London, Ont.
Legislation upon Forestry……… *P. J. U. Beaudry*, Beauharnois, Que.
Roadside Tree-Planting……… *W. A. Hall*, Sherbrooke, Que.
What to Plant for Forest-Trees, for Groves, and Wind-Breaks, *Hon. Suel Foster*, Muscatine, Iowa.
"Woodman, Spare the Tree"—The Forestry of the Niagara Section……… *J. R. Martin*, Cayuga, Ont.
Conditions of Forest Growth……… *Bernhard E. Fernow*, Slatington, Pa.

The Congress then adjourned to meet in general session on the morning of the 23d. A public meeting was held in the evening, at Queen's Hall, at which remarks were made by the HON. JOHN EATON, U. S. Commissioner of Education, and an address was delivered by Dr. GEO. B. LORING.

(To be completed in the next number.)

CONDITIONS OF FOREST-GROWTH.*

BY BERNHARD E. FERNOW, OF SLATINGTON, PA.

TO clearly understand and devise methods of forest management, and to foresee the results of such, it is primarily essential that the natural conditions of forest-growth be first well understood; that the principles be first recognized on which rest forest-production. This is the more important, as forestal operations extend over long periods of time, and the results and effects thereof are often recognizable only when the growth of many years has been irretrievably injured, thus inflicting a heavy financial loss on the economy.

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*Read at the meeting of the American Forestry Congress, at Montreal, August 22, 1882.

In this paper, the endeavor has been, not to produce any thing new and original, but rather to so arrange the known facts of the natural sciences which contribute to the understanding of the conditions of plant-growth, that they may easily be applied to the study of forest-reproduction, a subject important before all, to us at this present moment.

As the idea connected with the term "forest" is vague and undefined, I am desirous, before I proceed, to clear the conception of what *may* or *ought* to be called a forest. When we speak of a forest in connection with the science of Forestry, we do not mean a mere collection of trees, a wood, or a park, a plantation, but an aggregate of trees or woodlands which are intended and so set aside for the production of timber or lumber. If we speak of planting and cultivating forests, we do not mean the laying out of parks or groves, which have a very different object in view, which present very different conditions of tree-growth, and require, in consequence, very different methods of culture. Forestry has nothing to do with the planting of fruit or ornamental trees, nor, indeed, with single trees—just as agriculture does not consider the individual wheat plant. The object of Forestry is a financial effect, which is represented by the highest rent from the soil through the cultivation of the same for timber-growth.

Of the factors which condition forest-growth, the soil presents itself first to our consideration.

The soil forms the standing-place of the forest-tree, as it is that of the wheat plant. But this similar use of the same factor, must not induce us to assume too close a resemblance between agricultural and forestal conditions of growth.

It is natural that, since Agriculture and Forestry have both to do with the products of the soil, they should be compared with each other, and the principles which govern the one are often mistakenly applied to the other. The difference in these two branches of economy is not merely one of financial import. Though both these sciences—or, arts, if you prefer the term—have to deal with the products of the soil, this factor takes a very different part in each. The writer has seen numerous statements in books, papers, and journals of this country, pointing out the necessity of a change in species in renovating a forest, thus applying the rules accepted in Agriculture, on the authority of Liebeg, for the rotation of crops. Any one who has had to do with Forestry, however, will know that not only is the same species of tree propagated on the same place for centuries, but that, at least with some species, the production increases the longer they are propagated on the same ground. That the foliage falling every year and accumulating does, in a degree, replace the manuring and plowing practiced in Agriculture, is not the only cause why the same species can grow and be reproduced on the same place for a thousand years, as is the case with extensive Beech, Fir, and Spruce forests in Germany. From this experience it would appear, that the effects of those operations, which, we see, the farmer deems it necessary to apply in the tillage and manuring of his soil, are unnecessary to the forester.

We shall at once see the reason, when we consider the aims of the two.

The farmer's manipulations mainly tend to increase the soluble inorganic elements of the soil, in order to get the highest yield from his field. He applies his energy to produce the greatest amount of proteine compounds, and with these to remove from his soil the maximum of sulphur and phosphorus. He does not pretend, as does the forester, to raise plants in their natural condition, but only such as have been brought by a continued cultivation to an abnormal state, developing one part, to the detriment of another. In Asia, the native country of the wheat, our cereals do not differ in their habitus from the common grass. In Chili, in its native state, the potato produces bulbs not larger than a pea, and, according to Darwin, the yield of one acre would not suffice to sustain for one year the life of one Irish family. It is the *abnormal* abstraction from the soil of such enormous quantities of mineral constituents for the formation of amydon, gluten, dextrine, sugars, etc., which necessitates the replacing, in the form of manure, of these elements which are taken from the soil with the reaping of the grain; or, since the different plants abstract different quantities and qualities of the different inorganic elements from the soil, calls for a rotation of crops.

The experiments of Pollstorffe and Wiegman have, beyond doubt, demonstrated that the inorganic basis of the soil form an essential factor for the development of all vegetable life, and the quantities of the same, as found in the ashes of different plants, may be considered as indicating the amount of these materials needed for their full development. We have said that plants differ in the quantity and in the kind of their mineral ingredients very greatly, some of them existing in large quantities and in every soil, others almost entirely lacking in many, and only found in small quantities in others.

Now, to make a proportional comparison of plants with regard to the impoverishment of soil, which they severally produce, it is important to determine the kinds and amounts of mineral bases each plant requires. A few results from many analyses by good authorities on this point, may suffice to show the position of Forestry to this question.

Whilst the percentum of inorganic bases in all kinds of wood scarcely ever exceeds 3 p. c., and mostly remains below 1 p. c. of the dry substances, we find the ashes from hay 6 p. c., wheat and rye straw a little over 4 p. c., and that from oat chaff not less than 18 p. c. The farmers reap grain and straw, whilst the forester, if he consults his own interests, allows twigs and leaves, which contain the greatest part of the inorganic constituents of the tree, to remain on the ground.

If we compare the amount of mineral substances which are severally removed by a field crop and a timber-growth, we find that a wheat-crop abstracts from the same area five times as much inorganic bases as the Beech, ten times as much as the Pine; the turnip ten times the amount of the Beech, and twenty-two times that of the Pine.

From this comparison of well-authenticated calculations, it would appear, that tree-culture has the advantage over agriculture as regards the quantity of inorganic bases required.

Still more favorably stands the case, if we compare them qualitatively.

The wheat, for instance, yields yearly from one hectare, according to Fresenius, 32.55 kilo. of potassium, or five times as much as the Beech, and nearly ten times as much as the Pine; of phosphoric acid 20.31 kilo., which is five times as much as the Beech and ten times as much as the Pine; of sulphuric acid 20.58 kilo., that is fifty-seven times as much as either tree; of silicic acid 129.35 kilo., or thirty-seven times the amount of the Beech, and as much as one hundred and forty-three times of the Pine. It is not be forgotten that sulphuric and phosphoric acids are very scarce in any soil.

The Beech, however, requires considerably more lime than wheat, the latter yielding 12.93 kilo. per acre to 20.29 kilo. for the Beech.

Whilst, then, these trees, and, undoubtedly, all others, use chiefly these inorganic elements, which appear abundantly in every soil, Agriculture robs the soil of its rarest components.

We may here adduce the experience of farmers, that the winter crops do not need so much manuring as summer crops, and that the former prosper even on a soil of less mineral vigor.

This may be explained by the fact, that the winter crops have a longer term of vegetation, and during the same, find more opportunity to supply themselves, and assimilate the necessary inorganic elements; for the summer crops, on the contrary, it is necessary that the soil should be either well manured or easily decomposable. Our woody plants enjoy, like the winter crops, a long term of vegetation, and consequently can prosper on soils that are slow to decompose.

We have, then, from a theoretical point of view, sufficient reason to maintain, that the production of timber is much less dependent, nay, almost entirely independent, of the mineral composition of the soil. This truth we could easily demonstrate by observations from the practice in Germany, where, on the mica-sand of the main plain, and the sea-sand of the North-German plain—the poorest soils in regard to chemical composition, the finest growths of Pine and Beech may be found. Whoever has traveled through Saxon Switzerland, will agree that, on the sandstone of that region, which forms one of the poorest soils, in moist situations, Beech, Fir, and Spruce, species which require favorable conditions of growth, prosper exceedingly.

That it is not the mineralogical condition of the soil, but rather its humidity, which determines the forest-growth, may often be observed when, on a soil of the same origin and mineralogical composition, you find here a most excellent growth, whilst on the drier portions, the growth is considerably retarded and stunted.

We may claim then, that any soil in its natural condition, *i. e.*, which has not been used for agricultural purposes, contains sufficient inorganic elements for any timber-growth; that therefore the change of species observed in this country can hardly be attributable to an exhaustion of the soil, but to other causes, as we shall see later; that a change or rotation of crops, though it may be in some cases advisable for financial or even forestal reasons, is not a necessity for a successful Forestry, as it is in agriculture, and that, if taking place by itself, it is a sign of mismanagement of the original forest.

Finding, then, that the chemical composition of the soil is not of much importance in Forestry, it must be its physical condition, which determines a more or less prosperous timber-growth. And so we find all observations on the Continent, at least, coincide in this result, that the greatest mass of wood and the most regular growth of timber, is yielded by a soil which is deep, sufficiently loose and rich with humus, and which, at the same time, possesses a degree of humidity proportionate to the wants of the species growing thereon.

To understand the character of a soil, it will be necessary to discriminate several strata in the same; we may call that upper part of the soil, which the roots penetrate, the surface soil, in opposition to the lower strata or subsoil. These two strata may offer different relative appearances; they may be similar, *i. e.*, either both difficult to penetrate, like rock and clay, or else easily permeable, like sand, loam, or disintegrated rock; they may be of different character, when either may be hard or loose:. the commonest case being a hard subsoil, below more easily permeable surface-soil, as, for instance, when clay or rock or bog-iron-stone exists below sand or loam. Of course, these strata do not generally exist in this marked distinction, but in gradual transition, the looseness decreasing with the depth.

In the subsoil strata, the angle of inclination is of importance, as upon it partly depends the capacity of the soil to retain water. We discriminate in regard to water a pervious and impervious soil. Thus, plastic clay, undisintegrated rock, or a horizontal or only slightly inclined layer of subsoil, forms an impervious soil. If the subsoil present a vertical or strongly inclined stratification, an unfavorably quick percolation of the water may be the consequence, whilst a horizontal stratification, or impervious subsoil, may cause detrimental stagnation.

According to the depth of surface-soil, we discriminate a deep or shallow soil, which properties, however, must be considered relative to the species of tree which is to grow on it; for a soil may be too shallow for Oak, which is sufficiently deep for Beech and Fir.

Depth of soil, *i. e.*, a deep surface-soil, is especially desirable and important for such species as, like Oak and Spruce, form a tap-root, and which do not attain considerable height if the development of this root is impeded, especially when the lack of depth is not counterbalanced by extra humidity. The stunted growth of a forest, will speedily indicate such a locality. Depth of soil favors the tree growth for the reason that it provides a continual reservoir of moisture. Therefore, even those trees with shallow tracing roots, prosper best in a deep soil.

The shallowest soil is generally due to plastic clay, the tenacious quality of which prevents the roots from penetrating deeply: consequently it is not fit for Oak *timber* forests. The same disadvantages are caused by bog-iron-stone, which, consisting of a mixture of hydrous protoxide of iron, oxide of maganese, phosphoric acid, sand, and organic compounds, forms continuous slabs not far below the surface, presenting an impenetrable barrier to the roots. In the Province of Hanover, since its accession to Prussia, large areas of the Luneburg heath have been in-forestated by breaking up this stone with subsoil plows, and planting pine seedlings in the furrows, thus converting lands so long unprofitable into a source of wealth.

Looseness of soil, when accompanied by sufficient humidity, tends to produce a maximum of fibrous roots, which provide the plants with water and inorganic substances. Consequently the largest yields, and especially the greatest height of growths, is to be found on alluvial soil, which, from the manner of its formation, must be very finely divided. From this cause, too, results the fertility of the inundation soils of ponds and of the marshes near the sea-coasts. The superior growth on the fresh sweating sand, is due to its looseness and depth.

Though the looseness of the soil is most inducive to *largest* yields, yet a soil will produce a *good* yield, if it is only sufficiently deep and moist, such as that formed by disintegrated rock.

In regard to *humidity* the different species require a different degree of moisture. Most of the forest trees require only a "fresh" soil (which when pressed leaves traces of moisture in the hand); some species, like the Ash, prosper still in "moist" soil (which, when pressed, drop water); and the Elder requires even a "wet" soil (which drops water without being pressed). A dry soil is a favorite of no species, though Birch and Pine can best exist on it.

Two circumstances determine the degree of moisture in the soil, its character and its position. The soil in valleys, river plains, near lakes and seas, and on northern exposures, contains more humidity than that of the mountain ridges, or eastern and southern exposures. One quantitative determination of this difference is known to the writer, where the accretion of a Beech growth, 59 years old, on one of the Hessian mountains, was measured, and it was found that the accretion on the southern aspect bore the proportion to that of a dell and to that of a northern aspect as 16: 39: 48.

The favorable appearance of tree-growth on northern aspects may be considered due to the greater depth of soil generally found in such localities, and this again is due to the fact that the moisture, which promotes and expedites the disintegration of rocks, is not as quickly absorbed there as on other exposures more subject to the drying influence of sun and wind.

The lacking humidity of soil may be compensated by the humidity of the atmosphere, especially for such species as, on account of their dense foliage, like the Beech, evaporate profusely. This accounts for the excellence of growth in higher mountainous regions, where the atmosphere is generally moister than on lower levels.

Considering that 30 to 50 per cent is constituted of water, and of the dry substance forming the wood, called cellulose and lignin, 47 per cent is composed of oxygen and hydrogen in the proportion of water, it is no wonder that the humidity of the soil is of so much importance for timber-growth, and its supply may be held as the chief office of the same.

Another factor of the soil has been considered in the light of a plant-nourisher, and through its chemical influence, favorable to tree-growth. This is the *humus*, which forms the covering of all good forest-soils, and is produced by the decay of the yearly fallen foliage, twigs, etc., and other decaying vegetable matter, and consists of the combination of neutral salts. The acids, which are formed in some humus-soils, according to Liebig, are not components of a fertile humus, but belong to that of peaty and marshy soils, which are not favorable to tree-growth. Carbon, hydrogen, and oxygen are the main components of humus. It has been asserted that the humus ought to be considered as furnishing the supply of carbon, which forms the largest part in the composition of the woody fiber. For any one who has seen the forests of large extent along the dunes of southern France, and the sea-sand of the North-German plain, lacking all traces of humus, nay, containing so little carbon that after heating it will not leave a trace of black coloring, it needs not to cite Leibig's proof of the insufficiency of the humus or any part of the soil to provide the amount of carbon necessary for the building up of the tree and a forest. Besides, who could reasonably accept, as logic would compel us, the creation of decayed organic matter previous, and as a condition of following plant life!

Yet that there is a chemical influence of humus on forest growth can not be denied. Not only does the decaying vegetable matter develop a considerable amount of ammonia, which, imparted to the atmosphere, enriches it with the needed nitrogen, but also of carbonic acid, which contributes largely to the disintegration of the rock and increases the solubility of the carbonate and phosphate of lime. This influence will be readily admitted as important, when we remember, that in ten thousand parts of pure water, only one part of carbonate of lime is soluble, whilst in the same quantity of water acidulated with carbonic acid, ten parts of that salt will dissolve.

But the greatest significance of the humus, lies in its physical influence, which is the more important where the other factors of "soil-bonity," depth, looseness, humidity are lacking. A considerable layer of humus increases depth; as a bad conductor of heat, it counteracts the drying effects of the sun, which, added to its capacity of absorbing easily and retaining long the meteoric precipitations, makes it a very desirable covering of the soil. The humus being of medium looseness, tends to diminish the extremes of the physical properties of the soil.

We may here sum up the influence of the soil on forest-growth by stating, that its chemical composition is only of minor importance, almost all soils furnishing sufficient inorganis bases of the description which is needed by forest-growth; that its main influence consists in its physical properties, represented by its depth, looseness, and, depending on these, the capacity of absorbing and retaining moisture, which properties may be increased or even compensated for, by a sufficient layer of humus. The existence of these properties in their highest perfection in due proportion, are inducive to the prosperity of any species, yet the necessity of their existence is a relative one with regard to the different species.

Seeing, then, that the soil, though a contributor, does not furnish the bulk of those elements which form the fiber of the tree, we must look for another source of supply. By a simple mathematical calculation we find, that the 1846 kilo. carbon, which are represented by the yearly accretion of one hectare Pine forest, can not be supplied by the soil. There is, then, only the atmosphere left as a source of this component, as well as of the small quantity of nitrogen required.

We need not go into any proof that the quantity of carbon present in the atmospheric air is sufficient to grow wood on the entire area of our globe, nor need we apprehend any danger from overproduction of carbonic acid, to the detriment of vegetation. In short, we may conclude that, on the whole, we need not apprehend any danger of exhaustion of the sources of food, which our forests require, such as we see possible in our coal mines. But it is incumbent on us to utilize this inexhaustible source of plant-food by providing the proper means for its conversion into marketable values, that is, by promoting and directing the growths of forests.

(*To be completed in the next number.*)

ON THE DISTRIBUTION OF THE MORE IMPORTANT FOREST TREES IN THE GULF REGION.

By CHARLES MOHR, Mobile, Ala.

General Considerations.

THE great forest region which extends from the western slope of the southern extremity of the Appalachian chain, through the states bordering on the Gulf of Mexico, finds its boundaries in the West on a line extending from the upper waters of the Trinity River to the lower Brazos in Texas. West of this limit, in the great prairie region, it is restricted to the narrow strips of river bottom-lands. It is greatly reduced in size, and is limited to the valleys and to the declivities formed by the terraces of the western table-lands, where the forest growth, with the rest of the flora of Western Texas, presents strikingly different features. This is the result of the blending of forms, from the western side of the continent and from sub-tropical Mexico, with those of Eastern North America. The peculiar character of the flora of this western region is regarded as constituting a distinct botanical province, that may be called "the Texano-Mexican Flora."

Throughout the vast area covered by this eastern forest region there is much uniformity. Among the larger trees there are but few that may be said to be peculiar to any one section, such as *Pinus glabra* and *P. Cubensis*, species of restricted limits east of the Mississippi River, and the *Ulmus crasifolia* in the west. We have equally rare instances of species, which may be said to predominate more in the eastern or the western part of this region. Among these the Pecan tree (*Carya olivæformis*), common west of the Mississippi, is but rarely found, except in the bottom lands on its eastern banks, and the Tulip tree (*Liriodendron tulipifera*), one of the frequent trees of the eastern forest, becomes very scarce beyond the western shores of that river.

Great uniformity prevails also in their distribution from North to South. Each species follows lines but slightly deviating from the same latitude—greater differences in that respect existing westward. These Northern species extend further South, and the Southern ones find their northern boundaries in lower latitudes. These differences are found increasing toward the western limits of the forest region. As an instance of the former, the mossy over-cup Oak (*Quercus macrocarpa*) and the Red Oak (*Q. rubra*), trees of northern range, may be mentioned, which in Texas are the most frequent among the forest growth of the bottoms as far south as 29° latitude, while in Alabama they occur only as isolated stragglers a short distance below 34° and 31° respectively. On the other hand, the Southern Long-leaved Pine, which in Texas reaches its northern limit a short distance above 32°, is found in Alabama two and a half degrees farther north. These differences depend upon the changed climatic condition of the region west of the Mississippi, and are mainly due to the chilling influences of the north-western winds, sweeping with unmitigated force over the vast expanse of treeless plains west of the forest region, and to the diminished precipitation of atmospheric moisture.

The Southern Pines and the great timber regions of the Gulf States, with remarks upon the other Conifers of the Gulf-Region.—The "Long-leaved," "Yellow," "Hard" or "Pitch" Pine (*Pinus australis*), covering the largest areas, and being of the greatest value, ranks first among the forest trees of the Gulf region. It extends from the Atlantic across the lower Gulf region to the valley of the Trinity River in Texas. In that state it reaches its northern limit a little above 32°; in Louisiana and Mississippi it extends half a degree farther north, and in Alabama to near 34° 30′. It prefers a porous and highly silicious soil, and it covers almost invariably the strata of the sand and gravel of the Southern stratified drift, to the exclusion of almost any other tree. It thrives best where the subsoil has a mixture of clay, but that will still admit its deeply-penetrating taproot. On such a soil, classed as the best of Pine lands, this tree thrives best, and upon large areas from 20 to 25 trees can be counted upon an acre, with an average diameter of 20 inches and a height of 90 to 100 feet, their trunks free from the slightest knot for 40 feet, and their limbs spreading at from 60 to 70 feet above the ground. On sandy lands, more or less devoid of the clay subsoil of the lower Pine region, or the Pine barrens proper, the average stand of timber can be estimated to 3,000 feet of merchantable lumber per acre. Here the primeval Pine forest is free from all undergrowth. It is only in accidental openings that the view between the Pines is hindered by groups of Black Jack (*Quercus nigra*), Blue Jack (*Q. cinerea*), and the Turkey Oak (*Q. Catesbaei*). It is only on the most arid ridges, with a soil of almost pure, fine-grained and closely-packed sand, that the Pine shares the ground with the last mentioned of these Oaks. In the soils of a coarser sand, or gravel mixed with more clay, and which are, therefore, more retentive, as in the upper part of the Pine region of Alabama and Mississippi, and in Western Louisiana, as also in light sandy soils, more or less adjacent to the under-laying loams and marls of the tertiary formation, that the trees are found throughout of larger dimensions, and the yield of lumber per acre is double that of Pine lands of average quality. It has been found by many measurements to be 6,000 to 7,000 feet to the acre, allowing only one cut of 20 feet in length for each tree. On such soils, richer in plant-food, the trees are of quicker growth, the wood is of a coarser grain, less compact, and the timber somewhat inferior in strength to that grown on poorer lands. After the removal of the timber trees, the second growth varies with the soil. It is principally on the thin, porous soils of the summits of the ridges spreading out in more or less extensive plateaus, that the Pines are succeeded by trees of their own kind. In the lower Pine region, on the flanks of the low hills, or with their outcrops of argillaceous strata, and in localities where the clay-bottom comes to the surface, giving a certain degree of compactness to the soil, the Pine growth is succeeded by the upland Oaks, which always are of a scrubby growth, from the inroads of fire and cattle. The ground being shaded and covered by dry foliage, fuel is added to the conflagrations which every year sweep through these forests of Oak scrub, destroying the seedlings of the Pine, or leaving such as remain of a stunted growth. Upon soils of a better quality, as in the upper part of the maritime Pine-belt, the "Long-leaved Pine" is rarely seen among the second growth; but, instead of this, we find a mixture of deciduous trees and the short-leaved and Loblolly Pine. On the coast-plain of the Eastern Gulf States, with a damp soil and more compact subsoil, it is invariably succeeded by the Cuban or Slash Pine (*Pinus Cubensis*) of the flat-woods.

Of the life-history of this most important timber-tree little is known, as to the laws regulating its reproduction, or to guide us to its successful cultivation in re-juvenating its forest, or the maintenance of these valuable resources. The seeds shed in the early part of November, and germinate quickly in damp weather. If it happens to be showery and warm, the seeds begin to sprout before leaving the cones, and the seed-crop of the year is lost. The seedlings spring up freely in the openings of the forest; for sunshine and air are essential for the earliest stages of its growth.

To the fourth or fifth year, the straight and simple stem is covered, from the base up, with the long, slender leaves, and the prominent wooly terminal bud, rising above the dense reclining tuft of its foliage, imparts to the young Pine, a strikingly peculiar appearance. The stem, at a later period, loses its leafy covering, and begins to throw out a few horizontal and rectangular branches.

At the end of the first decade, it has formed a regular head, and is 18 to 20 feet high, with a diameter of 4 to 5 inches. Before the end of another 10 years, it begins to bear fruit. In half a century, it becomes a middle-sized tree, about 50 feet high, and from 6 to 8 inches in diameter, at one foot above the ground. From that period its growth is somewhat slower, and trees furnishing logs 15 inches in diameter at the top, are not less than 120 years old.

Trees two feet through, at three feet above the ground, are from 175 to 200 years old. The rate of growth varies considerably, according to the soil and conditions, and more observations throughout the vast areas covered by this tree are needed to arrive at correct data. The Long-leaved Pine forests in the Gulf States form the following distinct regions:

1. The great maritime Pine-belt, of the Eastern Gulf States, covering Western Florida, the southern parts of Alabama and Mississippi, and the largest part of Eastern Louisiana.
2. The central Pine-belt of Alabama.
3. The Pine region of the basin of the Coosa River, in Alabama.
4. The Pine forest in Walker county, Ala.
5. The great Pine region of Western Louisiana and Eastern Texas.

The maritime Pine region east of the Mississippi, according to the different features of its forest vegetation, presents two distinct divisions:

The lower, or coast-Pine belt proper, which form the banks of the Chattahoochee river to the bluffs, and the alluvial lands of the Mississippi, can be said to form one unbroken forest, covering an area of 28,000 square miles, exclusive of the marsh-covered lowlands fronting the Gulf shores, and the numerous bayous and inlets. Here the Long-leaved Pine has taken almost entire possession of the soil, with the exception of the flat woods along the coast, where it is found associated with the Cuban Pine (*Pinus Cubensis*, or *P. Ellittii*, of Engelman), to which it gives place completely, in closer and continually damp or boggy soil, and in the limited areas of hardwood-timber and Cypress brakes, which in narrow strips line the water-courses or cover the deep forest-swamps of the lowlands.

The northern limit of this division coincides closely with the line between the lower belt of the southern stratified drift, and the tertiary strata, distant on its eastern end 60 miles, and at its western 135 miles, from the Gulf coast.

North of this line, the forests are a mixed growth of coniferous and hard wood trees, forming the upper division of this great Pine region, which from this feature I have called the region of "mixed tree growth." The forests of Long-leaved Pine, here cover the more or less silicious and loose strata of the tertiary formation, and often quite extensive streaks of sands and gravels of the drift, which overlay to a greater or lesser depth, the marls and calcareous rocks of the older formation, and also the calcareous cherts, whose heavy outcrops occupy the higher ridges. Where the soil becomes of a better quality, by an admixture of the loams and marls, the lowly Pine is found with the Post-Oak, the Black-Jack, and the Spanish Oak, the Short-leaf and the Loblolly Pine, giving away at last to the deciduous trees, as the quality of the soil improves. The tree-covering in this division is as luxuriant as it is diversified. In the bottoms and the adjacent slopes, with a light but very generous soil, hard-wood trees prevail, affording an abundance of the most valuable timber. The Basket Oak (*Quercus Michauxii*), Willow Oak (*Q. phellos*), Swamp White-Oak (*Q. lyrata*), White Oak, Red Oak, Black Oak (*Q. tinctoria*) and Spanish Oak, the Shellbark Hickory (*Carya alba*), with the Pignut (*C. porcina*), Mockernut (*C. tomentosa*), associated with fine White-Ash (*Fraxinus Americana*), White Elm (*Ulmus Americana*), Magnolias, Cucumber trees (*Magnolia acuminata*), gigantic Red Gums (*Liquidambar styraciflua*), and Swamp Maples, interspersed with the Spruce-Pine (*Pinus glabra*), and the Short-leaf Pine (*Pinus mitis*), form an assemblage of forest trees, presenting a rich and varied store of timber-wealth. It can be safely assumed that about one-half of the area of this division is covered by the Long-leaved Pine, which shares the luxuriance of growth with the other trees. According to measurements taken at various stations, one acre yields fully twice the quantity of merchantable lumber as the same area in the lower division, or the Pine-barrens proper; the individual trees attaining much larger dimensions. On account of the greater rapidity and luxuriance of its growth, the wood is less compact and of a coarser grain, and somewhat deficient in the hardness, strength, and elasticity of the timber grown in the barren soil of the lower division. The area of this region of mixed growth, forming the upper division of the maritime Pine-belt has been estimated at 10,000 square miles. These, added to that of the lower division, give the maritime Pine-belt of the Eastern Gulf States an area of 38,000 square miles.

Fronting the shores of the Gulf with its fine harbors and safe roadsteads, crossed by navigable rivers, whose tributaries extend in all directions through its lower division, making, during the periods of higher stages, the water available for transportation to the mills, and intersected by several railroad lines and high-roads, leading to the markets of the East and North-west this great timber region possesses advantages found rarely combined for the utilization of its great timber wealth and the developments of the industries based on its capacities, which at present are successfully carried on with a great and constantly increasing activity. The products of the numerous saw-mills, besides the mean bulk of the various kinds of lumber for ordinary building purposes, consist largely of sawn square-timber of great lengths for heavier constructions, to which must be added the large quantity of hewn square timber and spars to meet an increasing foreign demand, and a vast number of cross-ties for railroad construction. With the exception of the latter, during the year ending September, 1880, 200,000,000 feet (board measure) of these products found their outlet in Pensacola, Fla.; 60,000,000 through the port of Mobile; 60,000,000 through Pascagoula, Miss.; 36,000,000 from the Pearl River at the Bay of St. Louis; 13,000,000 at New Orleans; 12,000,000 by the New Orleans and Chicago Railroad; 12,000,000 by the Louisville and Nashville Railroad; making a grand total of at least 400,000,000 feet, the home demand at these places being taken into consideration. Assuming that one acre on the average furnishes 3,000 feet of lumber, the above production involves the depletion of a little over 200 square miles of forest lands of their timber wealth in one single year. The production of naval stores, principally Spirits of Turpentine and Rosin, is solely carried on in this Pine region. At the present time it is almost wholly confined to the forests contiguous to the railway lines leading to the port of Mobile, and to the banks of the Alabama and Tombigbee Rivers.

With the increasing facilities of transportation this industry is extending annually over wider areas.

During the last few years, Turpentine stills have been erected on the Escatawba River, on the lower Pearl River, and in the forests of Eastern Louisiana.

More than nine-tenths of the products of the 56 distilleries in operation on the railroad lines and rivers mentioned, find their way to Mobile. According to the returns made to the Board of Trade in that port, the production of naval stores in the year 1880, amounted to 25,409 barrels Spirits Turpentine and 158,482 barrels of Rosin.

The records of the same office, extending over a period of eight years, show in the average, a production of 20,000 barrels of Spirits of Turpentine and 100,000 barrels of Rosin. The increase in the price of these products during the last twelve months, has given rise to a largely increased production. The active demand for the higher grades of Rosin has led to the abandonment of the greatest part of the older orchards under operation, and the number of trees boxed during the spring of 1881 and 1882 is larger than ever before.

The production of 160,000 barrels of Spirits of Turpentine during the eight years previous to 1880, caused the total destruction of nearly 1,000 square miles of timber land. There are no returns on record beyond the year 1873, but it can, without exaggeration be assumed, that 250 square miles of forest were devastated for the same purpose previous to that year. The stills in operation at the end of 1880, will during the next three years, involve the destruction of 380 to 400 square miles of virgin forest. At that rate, by the end of 1888, the complete destruction of another thousand square miles of Pine-forest, in the counties of Mobile, Baldwin and Washington, in Alabama, and in the counties of Wayne and Clark, in Mississippi, will have been accomplished. Contemplating such an enormous destruction of the Pine-forest, sacrificed to one single branch of industry, involving under the existing processes its total destruction, one might well feel appalled. To diminish the destruction of the forest by the Turpentine distillers, the following points suggest themselves as remedies to a certain degree:

1. The strict observance of a regulation by which no tree under the size fitting it for a saw-mill, should receive more than one box, and that all trees of a size so small as to be destroyed by boxing should be left untouched by the axe.

2. To secure the boxes against the damage caused by accidental outbreaks of fire in the orchard by a different method than that in vogue. As practiced at present, the firing of the orchard every spring, after the ground around the boxed trees has been laid bare for the distance necessary to keep the tree free from the touch of the flames, for the sake of the removal of all combustible material on the ground, causes not only the total destruction of the younger tree growth within the orchard, but gives rise to wide-spread conflagration, injuring in the same way large tracts of forest.

3. The utilization of the waste products of the saw-mills, known as slabs, kerfs, short-ends and saw-dust, which constitutes one-third of the timber, for the purpose of obtaining Spirits of Turpentine by a process of direct distillation. The product obtained in that way has met with considerable prejudice by the trade.

To find whether this is well founded, it will be necessary to ascertain how far the properties of the Essential Oil, distilled directly from the wood, are modified by a possible difference in its chemical constitution, or the admixture of impurities in the shape of isomeric compounds or other products of distillation.

The Central Pine-Belt of Alabama.—This Pine-belt traverses the state at its center, from its eastern to near its western boundary. From five to twenty-five miles wide, the Pine forest covers the interior drift-belt which separates the cretaceous from the palaeozoic formations. The area to be considered of value for its wealth in Long-leaved Pine timber, has been computed to comprise 550 square miles, after a due allowance for lands under cultivation or supporting a different tree-growth. The stand of timber is heavy and of the best quality. By numerous measurements, it has been found to fall not short of 5,000 feet to the acre, and its timber-wealth has been estimated to amount to 1,750,000,000 feet of merchantable lumber. During the year 1880, the lumber production in this region amounted in the aggregate to 90,000,000 of feet, which by the various railroad lines traversing it, find their way mostly to the the markets of the Northwest.

The Pine Region of the Coosa River Basin.—This region reaches from the base of the Lookout Mountain range, in Etowah County, near Gadsden, Ala., a few miles beyond the Georgia state line.

In its southern extent, after a short interruption, it follows the river at a distance of ninety miles.

It has been estimated that the forests of Long-leaved Pine cover within this region 300,000 acres, with a stand of timber equal to 900,000,000 feet of lumber. Gadsden, in Etowah County, Ala., is the principal seat of the lumber manufacturing, producing little over 20,000,000 feet during the year 1880.

The Pine Forest in Walker County, Ala., covers a detached patch of drift of 60,000 acres in extent. It is almost untouched by the axe, and the stand of timber is fully equal to 3,000 feet of lumber to the acre. The timber standing can be said to represent at the present time 180,000,000 feet of lumber.

The Pine Region West of the Mississippi River.—The forests of Long-leaved Pine cover the beds of drift, which extend from the center of the parishes of Bienville and Jackson southward to the plain of the coast in the lower part of Calcasieu parish, in Louisiana, and westward across the basin of the Sabine River to the valley of the Trinity River, in Eastern Texas, where the tree finds its extreme western limits.. In the State of Louisiana, intersected by the broad belt of alluvial lands skirting the Red River, its area has been estimated to cover 7,000 square miles.

By numerous measurements, an acre of these Pine lands will yield not less than 3,000 feet of lumber.

It is only along the Calcasieu and the Sabine Rivers with their largest tributaries, that the timber lands have been invaded to supply the lumber mills at Lake Charles, in Louisiana, and Orange, in Texas.

North and eastward, they have scarcely been encroached upon to supply the limited demand of the Red-River trade. The whole area embraced within this western region can be estimated at over 25,000 square miles.

The timber standing in West Louisiana, according to estimates based on my own observations, has been computed to be equal to 15,000,000,000 feet of lumber, and according to the returns of the census 20,508,000,000 feet in Texas, amounting in the whole to 35,508,000,000 for the region west of the Mississippi.

In review of these facts, and the estimates based upon them, it is shown that the forests of Long-leaved Pine occupy an area exceeding 54,000 square miles, with a timber wealth computed to represent 71,450,000,000 superficial feet of lumber, and with an annual production of 605,000,000 feet of lumber, 25,000 barrels Spirits Turpentine, and 160,000 barrels of Rosin.

This vast area covers the poorest soil, offering for many years, if ever, but few inducements to the farmer, and consequently is but sparsely populated.

In consideration of these facts, in the making of the estimates of the areas occupied by the Long-leaved Pine, an allowance of 25 per cent has been made for lands under cultivation, or otherwise deprived of their timber growth, including also the hammock lands lining the water-courses and covering the swamps, which has been thought to serve as a fair basis in the computation of the amount of merchantable timber yet standing. The annual production of lumber, as given for the census year, leads to the abstraction of the timber wealth from 300 square miles; allowing two millions of feet to the square mile. According to such a rate, the forests of the Long-leaved Pine in the Gulf region would supply the demands of the lumber industries at the present stage of their activity for a century to come. Their exhaustion, however, will be certainly accomplished within a much shorter time. Easy of access, and with the increasing facilities of communication and commercial intercourse, new markets for the products of their timber wealth are constantly opening, and with the exhaustion of the timber supplies of the old world, the demands upon the lumbering capacities of the forests of Long-leaved Pine in the Gulf region is ever increasing. The constant use of the value of timber leads to investments in opening the remoter parts of these forest regions, heretofore regarded as too far removed from the water-courses to make their timber available with any profit. In many localities throughout the Eastern Gulf States, canals, tram-roads, and railways have lately been built to traverse the forest from one river basin to another. Combined with the constant improvements in the construction of the machinery of the mills, such investments give with every year a renewed impetus to the utilization of their rich stores and to their exhaustion, at a rate by far exceeding that of former periods. The next quarter of a century is sure to accomplish in that respect double, if not triple, what has been done in the past.

In the contemplation of this eventuality, the questions how to husband these resources to the best advantage, how to secure their contiuation for the future, and by what means the destruction of this great forest-domain is to be prevented, assume the importance of a national interest, grave enough to enlist the attention of the statesman, as well as of every other citizen caring for the welfare of his country, and to present a pressing claim for the consideration of those assembled here, for the purpose of devising ways and means to save the country from the impending evils, resulting from the heedless destruction of its forest growth.

(*To be continued.*)

MISCELLANY.

Australian experiences of the effect of Woodlands upon Climates.—"*The Indian Agriculturist,*" in noticing the effect of clearings upon the climate, remarks: "They now find in Australia that great destruction of trees has had a most important effect on the climate, and that the rainfall and consequent supply of water has materially decreased." The same effects had been noticed in New Zealand, where the destruction of Forests has been going on at the rate of twenty per cent a year in some regions. The journal quoted, adds: "Drouth not only means in these climates enormous loss of stock and crops, but it means increased dry-fodder for the bush fires, which cause such devastation."

Timber used for Carriage-Making.—The "Carriage Makers' National Association," at Cincinnati, in 1881, appointed a committee, consisting of Mr. Jacob Maris, of Dayton, O.; Mr. Howard M. Dubois, of Philadelphia; and Mr. J. M. Studebaker, of South Bend, Ind., to report at their next meeting at Philadelphia, to be held October 18, 19, and 20, 1882, all the facts they could obtain relating to the product in this country, of the timbers that enter into the construction of carriages, and to make such recommendations, or present such arguments founded upon facts as they might deem proper, with reference to the probabilities of its being exhausted; and also the question as to whether it would be advisable to cultivate such timber as might be exhausted.

Lectures upon Forestry before the Peabody Institute in Baltimore.—A course of four lectures will be delivered at the institution above named, by the Editor of this Journal, upon the evenings of the 9th, 11th, 16th, and 18th of January next, the subjects being as follows:

Jan. 9, 1883: "Natural Distribution of Forests, and General Views concerning them."

Jan. 11: "The Sanitary and Climatic influences of Forests."

Jan. 16: "The effects of Denudation of Forests."

Jan. 18: "The Restoration of Forests."

Bartram Garden.—Upon page 45 of our first number the reader is requested to correct the date of planting of the Bald Cypress to "1740."

Sickness ascribed to the Accumulation of Sawdust and other Rubbish from Saw-mills.—Dr. B. F. Sherman, of Ogdensburgh, N. Y., in a correspondence relating to the sanitary condition of that city and vicinity, as influenced by the lumber business upon the Oswegatchie River, says:

"All forms of malerial diseases are increasing in this locality, so much so that malaria is a permanent factor in all diseases we have to treat. I attribute this to the principal causes: First, the increased lumber interest, and the multiplication of mills on the Oswegatchie, at each one of which all the saw-dust and refuse are dumped into the river, and the high waters of spring and fall bring them down to our pond (which is very large), where it settles upon the sand-banks. As soon as the water lowers, there is a large surface of decaying vegetable matter exposed, and in the hottest weather there are hundreds of acres thus exposed. The other cause is, from our large lumber of mills here, which cart off their shavings and saw-dust, and dump them into low places on the borders of the river, to fill up, and make land. This is wet or dry as the river varies, and all the time exposed to the sun. I think these are the cause of the increase of these forms of disease; — for our town has a good system of drainage, and is every year extending and perfecting it."

Northern Limit of the Hemlocks.—The Abbe Provanche, in his *Flore Canadienne*, corrects an error in the statement of Michaux, and copied by the Abbe Brunet, concerning the northern limit of the Hemlock tree. In the pamphlet entitled, "*Voyage d'André Michaux en Canada*," p. 18, it is remarked, that this tree begins near the Hudson Bay, and that around Lake St. John it forms whole forests. The writer cited affirms that he has never met the "Pruche" in those regions, and that it is wholly unknown both on Lake St. John, and on the Saguenay. He assigns its northern limit at Cape Tourment, north of Quebec, although a few specimens may occur in Charlevoix county.

According to Dr. Bell, (*Geographical Distribution of the Forest Trees of Canada*), the eastward and northern limit of this species is at the Bay of Chaleur. It is scarce near the eastern coast of New Brunswick, but very abundant in the northern part of Nova Scotia. It crosses the St. Lawrence a little below Quebec, extending further down on the north than on the south side. Thence it reaches the north end of Lake Temiscaming, and the eastern extremity of Lake Superior at Agawa, south of the Michipicoten River. On the south shore of Lake Superior it does not reach the western extremity, but turns southward in the neighborhood of Ashland. An outlying grove is mentioned at Thompson, about 25 miles west of Duluth. The Hemlock maintains a good size, to the verge of its range, and always appears to terminate abruptly.

The Larch and the Pine in Iowa.—In cultivating the Larch and the White Pine, the Iowa Forestry Annual (1879, p. 6) recommends them to be set in rows four feet apart, every alternate row in Larches three feet apart in the rows. When the Larches are thinned out as poles, the Pines will stand eight feet apart each way. It estimates the cost as follows for each acre:

4,200 Larch plants (12 to 15 inches high..	$ 42 00
1,400 White Pine Plants (12 to 18 inches high	28 00
Preparing the ground and setting	15 00
Culture for four years	25 00
Total cost	$110 00

It estimates the poles as worth 15 cents each at the end of eight to twelve years, and shows a profit of $520 above the outlay, not including the interest on the investment nor the value of the pines.

Tree-Planting in Iowa.—The Forestry Manual of the Iowa Horticultural Society recommends the following trees for cultivation in that state, for the uses named:

Shelter Belts: Soft Maples, Balsam-Fir, Douglas, White, Norway and Black Spruces, Yellow and Paper-Birch, Red Cedar, White and Silver-Leaf Poplars, White and Green Willows, and Basswood.

Fuel: Maples, Sweet and Black Birch, Hickories, Hackberry, Ash of all species, Honey-Locust, Aspen, Cottonwood, Poplars, Oaks, Willows, and Elms.

Ornament: Maples, Balsam-Fir, Spruces, Sweet Buckeye and Horse-Chestnut (in south half), Ailanthus (in south half), Birches, Barberry, Shell-bark Hickory, Catalpa, Black-Cherry, Hackberry, Chestnut, White-Cedar, Scarlet-fruited and Cockspur Hawthorns, Ash of all species, Honey-

Locust, Coffee-nut, Red-Cedar, Larch Tamarack, Mulberry, White, Scotch Austrian and Heavy Pines, Oaks and Elms.

Sugar: Sugar Maple and Box-Elder.

Manufacture: Douglas, White and Norway Spruces, Ailanthus, Yellow and Sweet Birch, Hickories, Catalpa, Black-Cherry, Hackberry, Chestnut, White-Cedar, Ash of all species, Honey-Locust, Coffee-nut, Butternut, Black-Walnut, Larch, Tamarack, Osage-Orange (southern part), Mulberry, White, Scotch, Austrian and Heavy-Wood, Pine, Aspen, Poplar, Cottonwood, Sycamore, Oak of various species, and the Elms.

The White Buckeye is found to be well suited for the Manufacture of Paper-Pulp, and is placed first on a list of a western manufacturer, in the order of preference, as derived from his experience. He placed after this, the Cottonwood, Tulip-tree and Linden. The latter makes a pulp, having a slight tinge of pink.

The Corsican Pine (*Pinus larico*) grows five hundred years or more, and by its uniform and slow growth, produces wood of great density and holding a considerable amount of resin. Its greatest fault is the relatively large share of sap-wood. A specimen 554 years old, at the Paris Exposition of 1878, had 382 layers of sap-wood.

The Three-Motion System of Planting.—The following is the substance of a paper prepared by *Mr. Robert Douglas*, of Waukeegan, Ill., as practiced sucessfully by him, and on an extensive scale. In planting the Catalpa, he proceeds as follows:

The land prepared as for corn, is rolled, and marked 4 by 4 with a corn marker. The trees are heeled-in at convenient distances, or are sometimes distributed in boxes, a wagon following the planters, to hand trees at any moment. The men work in companies of three each, two with spades, and one holding and placing the trees. The two men take each a row, the tree-holder standing between the rows, and a tree should be placed at every point where the lines intersect. The planter strikes his spade down vertically on the mark, close up to and beyond the angle, and then takes up a spadeful of earth, so as to leave two straight sides to the angle. While he is raising the spadeful of earth, the man holding the trees inserts one, the planter drops the earth, places his foot firmly, close up to the tree, and steps forward to the next mark. In this way there is not a motion lost: the first stroke of the spade is needed to allow the earth to come up clean from the corner, and is done in an instant, for the man naturally carries his spade in the left hand, and when he takes a step forward, he simply strikes the spade down on the mark, with its face to the right, draws it out, and places it directly on the cross-line, close up to the corner, raises up the earth, and drops it down again upon the tree.

A boy can attend the men, but it keeps him busy. The trees are tied in bundles of 50 or 100, according to size. After a little practice, the tree will be brought to its place by an upward curving motion, that will spread out the roots, as well as they could be spread with the fingers. The best spadesmen differ in their practice; some inclining the spade a little to the right, in raising it, to give room for placing the tree, never raising it higher than the knee, while others raise it waist high, and bring it down with great force, throwing it from the spade into the hole, so that it packs the tree quite solidly. The earth is not inverted, and leaves the surface as if it had not been disturbed. By this mode of planting, 1500 trees can be planted in a day of ten hours, for each man and boy, or 4,500 for the three in a day. For large trees, a single spadeful of earth will not make a hole deep enough, and the time required is longer.

Recent Forestry Legislation in Canada. —By an act, assented to May 27, 1882, entitled "An Act to encourage the planting of Forest Trees," the Legislature of the Province, it is provided, that for every acre planted upon land owned or in possession by usufruct, the planter shall be entitled to receive a land-order for the purchase of other land, not exceeding $12 in value, of public lands open for sale in the district, or, if there be no agency, then in the nearest agency of another district; but not until the trees have been planted three years, and are shown to be in a vigorous and healthy state, and the land securely fenced against both sheep and cattle. The cultivation of root crops among the trees is allowed. The land-orders are transferable, but must be used within two years after their date. Land once planted can not be again entered for another order. The Lieutenant Governor in council may, from time to time, make regulation respecting:

1. The number and description of trees to be planted in each acre;
2. The number of years, during which the trees so planted, shall be preserved and not cut down;
3. The other terms and conditions to be fulfilled by persons claiming a land-order.

He may also appoint and proclaim an "Arbor Day." These regulations may be altered or repealed, without affecting any right acquired under such regulations. No land can be acquired under this act, unless of fifty acres in extent, and not over two hundred. If the order is for less than fifty acres, the balance may be paid in money. The planting of seeds, nuts, or cuttings, will be deemed a compliance with the law.

The law against forest fires in the Province of Quebec, was amended May 1, 1882, so as to embrace the following restriction:

"No person shall, in the forest or at a distance of less than a mile from a forest, set fire to or cause to burn, any pile of wood, branches or brushwood, or any tree, shrub or other plant, at any period during the year. It, however, shall be permitted for the purpose of clearing lands at any time, except between first July and the first of September in each year."

Seeds are worth less than young trees.— Therefore in planting, it is better to put in two or three, where you expect but one to grow. They are liable to various accidents, either from not being fully ripe, or from injury after they have sprouted. It is always well to have a choice, and it is an easy matter to save the best.

Protection from Forest Fires. — Mr. Joseph S. Fay, in noticing the destruction of woodlands by forest fires, during long spring and summer drouths, suggests that plantations should be made in blocks of 10, 20, 40, or even 100 acres, separated by spaces at least 100, or what would be better, 300 feet wide. Upon Cape Cod it had been found easier to check fires along the line of roads, which afforded the best opportunities for defense, and the most favorable place to commence back-firing. A fire such as sweeps through the wire-grass of southern forests, might not perceptibly injure the large timber, but it would kill those of a few year's growth, and sweep away the labors and hopes of a dozen years in half a day.

This method of controlling fires by the aid of "fire-guards" or open avenues through the woods, is well understood and much practiced in Europe, and especially in coniferous woods. They should be cleaned out carefully every year, so that the surface is kept entirely bare. Besides their obvious use in opposing the spread of ground-fires, they afford convenient opportunities for access, and roadways for the removal of products. In the case of resinous forests, they allow the air to circulate freely among the trees, thus favoring their growth; and to secure greater effect, they are laid out so as to get the sweep of prevailing winds.

The Cultivation of the Catalpa speciosa in Nova Scotia.—Mr. Robert Burnett, of Pictou, N. S., at the recent meeting in Montreal, reported that he had planted, in 1880, one hundred young Catalpas at his place, in about lat. 45° 45′, on a sharp gravelly soil, and southerly exposure, without loss of a single tree. Precaution had been taken to avoid the drying of the roots in the sun, and the plants were protected by a layer of spruce branches at three freet from the ground. This protection was removed early in September, to allow the wood to ripen. When frost began to appear, about the middle of September, the plants were completely covered with river sand. In the spring of 1882, several of the trees were distributed to other persons in the county, and they had made a satisfactory, and in some cases, an unexpected growth. He expressed a hope that the tree would be found adapted to the climate of that region, and even become a tree of commercial value.

Mr. G. P. Pepper, of Milwaukee, Wis., related his experience with this species, which had not been successful at that place, but near the lake shore the tree had flourished.

BIBLIOGRAPHICAL NOTICES.

It is our intention to present from time to time, the titles of separate publications upon the subject of Forestry, in its various relations, and we had prepared a somewhat extended list of very recent European titles. The want of room, however, leads us to omit them, and for the present to give only such as have appeared in, or that relate to, the United States for the years 1880–'1–'2. The list is not complete, but others will be added as they come to our notice. Hereafter, care will be taken to have these titles given as early as may be after publication, and as fully as possible.

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THE ASH.*

BY MR. ARTHUR BRYANT, PRINCETON, ILL.

AMONG the useful trees indigenous in the United States and the Dominion of Canada, the different species of Ash hold a prominent place. In an article in the *American Cyclopædia*, the writer asserts that more than thirty species are found east of the Mississippi. Loudon, on the other hand, gives it as his opinion that all the American Ashes are only variations of a single species. Our best botanists, however, recognize six species east of the Rocky Mountains. Of these, the White Ash † is undoubtedly the most important and valuable. There is, in fact, no other of our native trees which could supply its place, in the manufacture of farming implements, or for all purposes where lightness, strength, and elasticity are required.

When full grown, the White Ash is one of the largest trees of our forests, but a cold climate seems to be necessary to its full development. I remember trees of the primitive forest growth on the hills of Western Massachusetts three feet in diameter, with a straight shaft forty feet or more to the branches. The largest Ash I ever saw was one near my native place, which was felled more than fifty years since for the manufacture of scythe snathes. It was fully five feet in diameter, and perfectly sound.

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* Read at the Montreal Meeting of the American Forestry Congress.

† *Fraxinus Americana* of Michaux, or *F. acuminata*, of Lamarck. The latter name is generally preferred.

In a soil and climate which suit it, the White Ash is of rapid growth. A cool, deep, moist soil is most congenial. It will not thrive in very poor soils, or such as sandy or gravelly and very dry. Trees which have grown most rapidly afford the best timber; that taken from stunted, slow-growing trees is comparatively weak and brittle. I have been informed that in Southern Kansas, the White Ash is small, crooked, and of no value except for fuel.

Like all American species, the White Ash is deciduous, the majority of trees, as far as my observation extends, producing no seed. There is reason to believe that most of the seed gathered and sown in Illinois and Iowa as the White Ash, was that of the Green Ash. The latter is common on the banks of streams in the West, and produces seed abundantly on small trees. Any one ignorant of botany, might easily mistake the seed for that of the White Ash. The seed of the White Ash is round, without margin, the wing attached to the apex; in the Green Ash, the wing is continued as a margin nearly to the base of the seed, which is acute.

The seed of the White Ash ripens by the first of October. When gathered, it should not be allowed to become dry. It will vegetate with the greatest certainty if grown in autumn. When this is done, it should be thinly covered with earth; and to prevent washing out by heavy rains, should be covered with leaves or straw, to be taken off in spring. If to be sown in spring, the seed should be mixed with damp sand to prevent drying. It will not come up if sown dry in spring.

Few trees bear transplanting better than the White Ash. The only insect I have ever known to attack it is the May beetle, which, when very numerous, sometimes strips it of its leaves. It does not grow so rapidly as the Green Ash for the first two or three years from the seed.

In planting the Ash with a view to the production of timber, it is necessary to grow the tree thickly while young, that they may be drawn up, with a clear straight stem, without large side branches. When of proper size, the trees may be taken from the seed-bed and planted in rows four feet apart, and two feet apart in the rows. When transplanted, the trees should be trimmed to a single straight stem, and as they grow, it will be proper to see that they do not fork, and shorten or remove any side branches that take too much from the growth of the main stem. Trees set at the specified distance will probably not need thinning till they are large enough for hoop-poles. The thinning must be continued as the growth of the trees requires it. From three hundred to four hundred trees are probably as many as can be grown to maturity upon an acre. Whatever rules may be given in relation to forest culture, the exercise of judgment and common sense is absolutely necessary, and must be employed in varying the practice to meet the circumstances of the case.

The Blue Ash (*Fraxinus quadrangulata*) is rarely, if ever, found east of the Alleghanies. In the valley of the Mississippi it grows principally upon alluvial lands. It seems to prefer the richest soil. It is common in the neighborhood of the Illinois River, as far north as Bureau county, beyond which it becomes rare. It is a large tree, reaching the height of seventy feet or more. It is easily distinguished from other species by the quadrangular shape of the young shoots. The bark on old trees is not furrowed like that of the White Ash.

The wood of the Blue Ash is not inferior to that of any other species, in the qualities which characterize the genus, and possesses the advantage of greater durability. It is extensively employed where it grows for the same purposes as the White Ash.

As the Blue Ash belongs naturally to a more southern climate than the White Ash, its cultivation may be recommended in preference to the latter south of the fortieth degree of latitude. It may probably be successfully planted north of its native localities where the soil is fertile. It is propagated in the same manner as the White Ash.

The Black Ash (*F. sambucifolia*) is sometimes sixty or seventy feet high, and two feet in diameter. It is found in the same latitudes as the White Ash, but usually in wetter soils, whence it is often called Swamp Ash, and Water Ash. It will nevertheless thrive in soils that suit the White Ash. The wood is very elastic, and divides easily into thin strips, which are used for coarse basket work, and for the hoops of flour, salt, and fruit barrels. For the latter purpose, it is the most economical wood that can be procured, and it is, perhaps, the most important use to which it can be applied. It decays speedily when exposed to the changes of dryness and moisture. The ashes are extremely rich in alkali.

The Black Ash may be planted upon grounds that are too wet to produce other valuable kinds of timber. Its uses are important, though less varied than those of other species of Ash. It is propagated like the White Ash.

The Red Ash (*F. pubescens*) is said to be more common than any other species in Pennsylvania, Maryland, and Virginia. Dr. Gray says it is rare west of the Alleghanies. I have never found it in Illinois, though I believe it exists in some localities. I can not pretend to an intimate acquaintance with it, and merely give the testimony of others.

The Red Ash grows in soils like those preferred by the White Ash. It is a smaller tree, and, as Michaux asserts, of much less rapid growth. The wood is said to be less valuable than of the White Ash, although it possesses similar qualities and is employed for similar purposes. It is probably better suited to the countries where it is most common than the White Ash. According to Dr. Gray, this species passes by gradations into the Green Ash. It is propagated like other species.

The Green Ash (*F. viridis*) is a small tree, seldom, if ever, reaching the middle size. It is found mostly on the banks of rivers, and is much more common in the Western States than in the Eastern. It is a handsome tree, with bright green, glossy leaves, which are nearly alike on both sides. It grows much more rapidly than other species of Ash for the first two or three years from the seed. The properties of the wood are similar to those of the White Ash, and its small size is the great objection to its cultivation for timber. The seed germinates readily if sown dry in spring; that of most other kinds of Ash will not.

The Carolina Water Ash (*F. platycarpa*) is a tree of small size, found in swamps in the Southern States, but does not appear to merit notice as a timber tree.

CONDITIONS OF FOREST-GROWTH.

BY BERNHARD E. FERNOW, OF SLATINGTON, PA.

(Continued from page 77).

YET tree growth, as well as all other vegetation, is confined in locality. Even the deepest, freshest, most excellent soil will refuse to support vegetation above the line of eternal snow. That the temperature of the climate generally exerts great influence on all vegetation may be inferred from the observation of the flora of different climates. As the temperature declines from the equator towards the pole, and from the sea level towards higher elevation, so we find that the forest-growth in both directions shows a less diversified appearance and species, and at last a decline in the number of individuals.

This question of climatic influence on tree-growth, becomes of practical interest, when the possibility for existence and prosperity of a tree-species under certain climatic conditions is to be ascertained, for the purpose of introducing new species, and it becomes necessary to determine, whether the thriving of a species depends on the mean yearly, the mean summer or winter temperature, or on the extremes of temperature. The solution of this question is as yet possible, only on grounds of observation in regard to the natural distribution of trees, or else must in each individual case, be ascertained by experiment.

It is not probable that the mean yearly temperature influences the growth much, as may be inferred from the fact that localities of equal mean yearly temperature show a very different influence on their timber-growth.

Whilst in Siberia, the Willow grows on frozen soil, which thaws for a few summer months, the St. Gothard Mountain, though enjoying a higher mean temperature than the locality referred to in Siberia, is entirely bare of all vegetation. It is rather more probable that the distribution of species depends mainly on the mean temperature of the summer, or better on the length of the time of vegetation. For tender species, the line of distribution will no doubt be determined by the lowest extreme of winter temperature, which may cause death by frost. On the contrary, extremes of summer heat, if accompanied by sufficient humidity of soil and atmosphere, are not opposed to the cultivation of species, which in their natural occurrence belong to northern or elevated localities with lower temperatures.

It may be mentioned here, that the different temperatures of the soil, depending greatly on its color, may hasten the revival of vegetation in spring, and thus expose the young buds to late frosts. In some localities, the phenomenon of frosts rendering tree culture hazardous, is due to a rapid evaporation of the moisture of the soil as in dells and vales, and on heavy impervious soils, where water is collecting and insufficient circulation of air impedes its speedy removal. Plateaus too, suffer often from frosts, when plains, with the same mean yearly temperature are left intact.

This phenomenon is mainly due to the increased radiation of heat during the night, because the thinner strata of air in such plateaus offer less resistance to radiation.

So far, we have considered such conditions of forest-growth as are in the majority of cases given, and often unchangeable; we have to accept them as they exist, and try to make the best of them. If our soil is a dry sand, we shall not be able in most cases to adapt it to the cultivation of Elder or Ash; if we live so far north that the period of vegetation is too short for the prospering of the Oak, we may as well not attempt its cultivation, and so on. There is little scope for changing the conditions of soil, air, climate, or at least the change can be effected only in an extended period of time, and by careful Forestry.

But here a condition of forest-growth presents itself, which largely, we may say entirely, lies in the hands of the forester; a condition which he is able to create and to control, on the understanding of which a successful management of his plantation must be based throughout. In fact we may say that the most important criterion in forestal operations, is formed by the relation of the forest-trees towards light and shade. The condition, created by the existence or absence of the proper amount of light, we should characterize as the principal one for the consideration of any manager of forests. We do not mean here to discuss the physiological influence of light, on vegetation in general, which shows itself in the decomposition of the carbonic acid of the air, thus furnishing the means of assimilation of the carbon, which is necessary for the growth of the plant, its coloring, the ripening of the seed, etc.; but the necessity of providing in the forest, a proper amount of light or shade according to the wants of different species in their different ages.

The credit of having drawn the attention of foresters to the importance of this relation of forest-trees is due to Dr. G. Heyer, now Professor of Forestry in Munich, the exposition of whose theory has induced a better comprehension, and a modification of existing methods of management.

It is a known fact, that the higher the organization of a plant, the more light is needed for its proper growth, with few exceptions, such as some cryptogams and mosses, which require direct light. Most of the mosses prosper with a small amount of light under the shade of trees, and disappear when the forest in its more advanced age, grows thinner. The contradiction to this rule, presented by the vegetation in mountainous regions, is only an apparent one, because there the frequent mists replace the shade of forest trees.

The most highly organized plants exist in that part of the globe, where the sunlight is most intense, and the farther we go from the equator towards the poles, the more increases the proportion of cryptogams to phanerogams.

Now the quantity of sunlight necessary for the development of the most highly organized plants, the cotyledonous, is very different for different species and genera. Many plants of this group, can only live in the shade of forest-trees, like the *Asperula* and *Monotropa*, and disappear with the removal of the forest. So do the forest-trees themselves, evince a difference of requirements with regard to light and shade, and on these different requirements, are based many important forestal operations.

All forest-trees may be classified into three groups, which, however, gradually run into each other, and express the relative position of each species with regard to its need of light or shade. We may call these groups the shade-loving, shade-bearing, and light-needing. Criteria for the classification of the different species into these groups are given in the appearance of the foliage, its greater or lesser density, in the capacity of overshadowed branches and trunks to sustain life and to withstand the shading out by the domineering neighbors, and in the power of young seedlings to prosper in the shade of their mother trees.

In judging of the foliage of a species, such specimens as have grown in the full enjoyment of sunlight, ought not to be chosen as samples, because this full enjoyment of light, tends to enlarge the amount of foliage and so to form a denser crown; it is only in the forest, that the characteristic appearance of foliage belonging to each species can be discerned.

Those species, which form dense crowns, evidently need less light than those with higher foliage, for, as the interior leaves of the former get less light, and yet vegetate, it is evident that they need less for their existence. Yet, though some species, like the Fir, are so tenacious, that for sixty or more years, they will preserve life under the dense shade of the overshadowing forest, there is no doubt that all species, after a certain period of life, prosper best and increase in the greatest ratio when in the full enjoyment of light, because light favors the production of a large number of leaves, which in their turn excite greater activity in the processes of life or growth of the plant.

This effect of the sunlight is probably not so much due to its luminous quality as to its temperature, which incites evaporation through the leaves and with it circulation of the sap.

It is natural that species with a dense foliage *i.e.*, with a large leaf-area, tend at the same temperature, to evaporate more water than those with lighter foliage, and, therefore, draw more heavily on the moisture of the soil than the latter, or we may say on the same soil, under the same conditions, the trees with light foliage, will longer withstand the drying effect of the hot sun, than those with dense foliage. This influence of the sun, inducing increased evaporation, tells especially in young plants, where the roots are drawing their supply of water from a confined area, and the foliage does not stand in a favorable proportion to that area. In this period of life it is of the utmost importance to the forester to understand this inter-relation of sunlight, foliage, and humidity of soil, to shape his operations accordingly.

The writer is as yet not sufficiently conversant with the requirements in that respect of the species, which forms the forests of North America, to be able to attempt the establishment of a scale, denoting the relative capacity of the species to sustain shade, or their comparative demand for light.

In Germany, where we have only fifteen or sixteen species, that may be considered worthy of notice in the realm of Forestry, Dr. Heyer established the following scale, in which the first three or four species named, are those that demand in their youth an unprepared soil, shade for their proper developments, the others in their sequence are placed according to their capacity of sustaining shade, the latter absolutely requiring direct light for their development.

The series is:

Spruce (*Abies pectinata*, etc.)—Fir (*Pinus abies* L.) equivalent to *P. balsamea.*

Beech (*Fagus sylvatica* L.)—*Pinus austriaca* (*nigricans*)—Chestnut (*Castanea vesca*)—Hornbeam (*Carpinus betulus*).

Ash (*Fraxinus excelsior* L.)

Oak (*Quercus robur*), practically only *one* species in Germany against fourteen in the United States.

Maple (*Acer campestre* and *A. pseudo-platanus*)—Alder (*Alnus glutinosa* and *A. incana*).

White Pine (*Pinus strobus*).

Common Pine (*Pinus sylvestris*).

Elm (*Ulmus campestris*).

Birch (*Betula alba*)—Aspen (*Populus tremula*)—Larch (*Larix Europaea*). The first tree (in Germany in unprepared forest soil) can not be forwarded without the protection of nurse-trees. In nurseries, and where the preparation of soil favors a stronger development of the roots, and the capacity of the soil to absorb moisture from the air is heightened, plantations prosper without shade; so they sometimes succeed in mountainous regions with frequent mists and cloudy sky, yet, according to good authorities, nine out of ten plantations fail even there.

The fact that on a loose and sufficiently "fresh" soil the young growth of these species makes less demand on the shady protection of their nurses than in drier localities, confirms only this theory of the correlation of light, vegetation, and humidity of soil.

The Hornbeam, Ash, and Oak, and here we may add the American Chestnut, will go to seed under the overshadowing mother trees, but soon the vitality of the young plants will be impaired, and if with their increasing growth, the supply of light is not granted in proportion—they weaken and die. Here again a humid soil will help to sustain life longer, by producing a larger amount of leaves, *i.e.*, increasing the area for evaporation.

The species named towards the end of the list, demand at an increasing ratio the influence of direct light for their development, the Larch above all, finding it almost impossible to exist, where it is shut out from a perfect enjoyment of light.

That the American forest-trees make in this particular case an exception, no body will maintain, and there is no doubt that they can be similarly grouped as to their relation towards light and shade.

May we not here perhaps find a clue to the change of species or rotation, in the agricultural sense of the word, which has been observed in this country? Is it not the human hand which has produced indirectly this change, by destroying the conditions propitious for the one species, and favoring those necessary for another, by removing the shade of nurses, which the existing species needed for its youthful life and thus creating a growth of species that are more able to develop under the direct rays of the sun? Has not perhaps the indiscriminate denudation, giving access to the scorching sun and drying winds, reduced the humidity of the soil, so far as to exclude the existing species from satisfying its greater demand for moisture?

In changing other conditions of growth to such alternations of species are natural: Removing the valuable timber before the seed was dropped, will invariably give preponderance to the quick-growing mostly less valuable kinds, which bear seed every year, and whose light seeds are carried over large distances by winds, insects, etc.

We will not dwell on this theme, which has so unfortunately drawn the attention of the cis-atlantic foresters in the wrong direction, and only once more lay stress on the consideration, that no chemical condition but the *physical* conditions of forest-growth are underlying the noted alternations of species; species, that with regard to climate and soil, are more easily accomodated, such as produce more and easily dispersed seed will conquer the captious ones, and those with heavy seed and deep-rooting kinds will maintain existence in regions where continuous drouths would kill the shallow-rooted ones in their youth; species that require a long duration of the vegetation period, will recede or be overpowered by the quick-growing ones; species of slow growth may be crowded out when quick-growing ones find otherwise favorable conditions. Territories which offer favorable conditions to only one or a few species, will present pure forests (of one or nearly one kind only), whilst more diversified conditions, will through centuries show a varied appearance of forest; in the end perhaps, however, the shade-enduring, long-lived, heavy-seeded ones will domineer. In forests where the shade-loving species, such as Beech and Spruce, have acquired absolute sovereignity, in consequence of human management (absolute clearing), the light-foliaged and light-seeded kinds will gain ground. In short, these appearances and changes are the result of that continuous struggle for existence, which pervades all nature, and is modified in many ways by the hand of man.

I know that I have incompletely, and in a general way, pointed out some of the more important conditions, which underlie the growth of our forests. I have done so without any attempt to exhaust the theme in any particular, but have merely endeavored to draw your attention to the fact, that the whole science of Forestry is built, or, in the case of this continent, is to be built upon a very complicated system of elementary knowledge, which can only be gathered by local observations, based on a correct understanding of the physical forces at work.

Though there are many minor and local influences conditioning forest-growth, those discussed in the foregoing remarks may be considered as the principal and determining ones, and without tracing step by step the deductions possible from these for a correct management of forests, we confine ourselves to giving, in conclusion, in the form of short theses, such rules of management as result from a logical consideration of the foregoing expositions, the observation of which will at least insure a healthful preservation of existing and a successful growth of new plantations.

1. The principal effort of the forester must be to preserve and increase the "soil-bonity" as defined in the foregoing paper, since upon it depends the productivity of the forest.

2. The measures to be adopted for this purpose are not much to be sought in direct operations on the soil, but mainly in certain considerations in the selection of species, methods of management, terms of rotation, interlucation, methods of reproduction, and in the general care of the forests.

3. Only such species should form the predominant part of the forest, as are able to preserve the "soil-bonity." These are the shade-enduring and the evergreen.

4. Where an increase of depth loosens and humidity is especially needed, it is essential that such species should be cultivated, as through a plentiful fall of leaves, favor the formation of humus, and by the density of their crowns, keep out the two enemies of humification; sun and wind.

5. If for a length of time one species alone is to be cultivated, it must be one with a dense foliage. Light foliaged ones can only be allowed where nature has provided in some other way for the conservation of the "soil-bonity," because they not only furnish too little material for humification, but impede the latter by giving sun and wind access to the soil, thus drying it up and impoverishing it.

6. Mixed forests afford greater security against damages by wind, fire, frost, snow, diseases, besides yielding a large amount of wood. In these the predominent species must be one of the shade-loving or enduring, densely-foliaged, which protect the soil. The light-needing, thinly-foliaged species are only to be mixed in by single individuals, and not in groups, and must be quicker growing or have an advantage in age or height.

7. Two or more shade-enduring kinds can only be mixed, if they are equally quick growing.

8. In growths which in later years become less dense, any underbrush is favorable as protection against sun and wind; the cultivation of such artificially may be advisable from financial considerations, though it may not be justified.

9. The distance of the plants in new plantations ought not

to be more than three to four feet, as only thus a sufficient covering of the soil can be effected. Besides the yield of wood per acre, stands in direct proportion to the density of growth, *i.e.*, the number of plants per acre.

10. Of all methods of management the timber-forests with natural reproduction from seed-trees, is best calculated to maintain the vigor of the soil, for shade-enduring species, if the cutting is done with necessary prudence, so that the soil is exposed as little as possible. Next to this method comes absolute clearing, with immediate artificial re-seeding or re-planting. This is almost the only method advisable for light-foliaged trees.

11. Short terms of rotation remove the protection oftener from the soil; long ones carry the danger of soil impoverishment, owing to the natural thinning out of most species in later stages of growth.

12. For interlucation the principal rule is never to deprive any portion of the soil of the protecting cover of the crowns; it is best to confine the thinning-out to the overshadowed dying trees.

REMINISCENCES OF FOREIGN TRAVEL.—(No. 2.)

BY THE EDITOR OF THE AMERICAN JOURNAL OF FORESTRY.

ARRIVING at Christiansand in Norway, on the morning of the second day from Leith, we dropped anchor, for an hour or two, but there was not enough delay for visiting the town or its suburbs. The coast as first seen, was nothing but a line of bleak and barren rocks; but in passing in among the islands, now and then a green valley appeared in view, and the few settlements on the coast appeared to be dependent upon the fisheries for their support. It is a voyage of about twenty-four hours from hence to Copenhagen, across the "Skagerak." The sea was calm, the sky serene, and as the shores went down below the horizon, there was nothing else in view excepting the sails of vessels, or the line of smoke from some passing steamer. Of these there were seldom less than thirty, sometimes many more within sight. The next morning, after passing within view of many farms and villages, and touching at Elsinore, now no longer the toll-gate of the Baltic, we landed at Copenhagen, late on a Sunday forenoon.

After getting settled at a hotel, and visiting the Thorvalsden Museum, we sought another place having a stronger attraction, in a distant part of the town. This grew out of the following circumstance:

In 1864, the writer then living in Albany, N. Y., and in charge of a public office, accidentally met with a young man in whom he came to take a deep interest. He was polite and well dressed, with an intellectual and thoughtful countenance, but extremely reserved, and slowly sinking with consumption. This cold indifference being broken, he was found to be wonderfully well informed, quick to master a new subject, and gifted with a talent for executing with rapidity and accuracy, almost any thing he undertook. He was familiar with half a dozen languages, had seen much of the world—had served as a private two years in our war, with every vicissitude of battle, prison-life and hospital, and had since his discharge, lived at various places in the West. Seeing that a deep anxiety was one day preying upon him, we got from him by close inquiry the fact that he was penniless, and that there was no prospects before him but the alms-house and pauper's grave. We gave him employment which he eagerly accepted, doing at least as much as three common clerks; but at length he was prostrated, and word was brought that he was dying. When we were left alone, he whispered his real name, and that of his father, to whom he requested us to write when he was gone; but he rallied a little, and lived some weeks afterward. In this interval, he related many incidents of his life, the faithful record of which would be stranger than romance. We learned more from his papers, which were sent to his father, a Danish Naval officer in Copenhagen, from whom we received lengthy letters completing what had not before been known. The story summed up is this: A wonderful precocity from infancy—an intuitive quickness in learning—a hungering after knowledge that nothing could satisfy, and in this pursuit, the purchase of books beyond reason or prudence, incurring debts, which finally led to his emigration, while still a lad of fifteen years.

It was this family that we sought, and from the father and sister of this young man, we received such a welcome as a stranger seldom enjoys.

There is a School of Forestry at Copenhagen, forming one branch of the "Royal Veterinary and Agricultural High School." The first school of the kind was begun at Kiel, in Holstein, in 1785; under the direction of Niemann, and was continued till his death in 1830. The German language was used, and the German methods taught, upon the precepts laid down by Hartig, and Cotta, and other leading educators in Forestry of that period. In 1832, the school was transferred to Copenhagen, and annexed to the Polytechnic School of that city, where it remained until transferred to its present connection in 1864.

The institution lies in the northern border of the city, in the middle of grounds containing groups of trees arranged by natural orders, and tastefully adorned with flowering plants and shrubs. The buildings are of castellated style, and there are various stables and out-buildings used for other purposes of instruction. It has a good library, laboratories and collection of apparatus, and of objects in Natural History. At Charlottenlund, a few miles distant, but easily accessible, is another collection of trees, upon grounds some eleven acres in extent, available for botanical instruction, as well as much used as a pleasure resort. The course of instruction extends through four or five years, depending upon the proficiency of the student, and of these, one or two are given to practical work. The course is free, and organized upon the plan of the Faculty of Sciences in Paris.

The Forestry Students attend the instruction of about ten professors, and in Mathematics, Chemistry, Botany, Natural History, etc., it is alike to all. After passing examinations, they must await appointments, of which during the last five years, about three have been made annually. The whole attendance in 1879–80 was 294, of whom the Veterinary Classes numbered 122; Agriculture, 76; Land-Surveying, 21; Horticulture, 14; Forestry, 44; and others 17. These numbers were rather above the average of previous years.

From Copenhagen we went by Railway to Elsinore, and on the way passed many peat-bogs, where this material is taken out in great abundance for fuel, and we noticed that it was used instead of wood or coal upon the locomotives.

The peat-bogs of Denmark present a most interesting study in Forestry, from the evidences that they afford, of the changes that have taken place in the forests since the time when man first inhabited the country. In the older portions, are found the remains of Pine trees, showing that these must have formed the prevailing timber, and with them the stone implements of primeval man. At a later period, the timber found in the peat, shows that Oak must have been once the principal forest tree, and with this, we find implements of bronze, that mark a more advanced stage in human history. At present, neither Pine nor Oak are found native in the forests, the prevailing species being Beech.

A carriage ride of several miles from Elsinore, afforded an opportunity for seeing some of the present forests of the country, of which about one hundred thousand acres are under the care of the Forest Administration. The percentage of forests in Denmark, is less than three and a half of the whole area, and ranks lower than any other country in Europe. Its colonies are wholly without timber resources of any kind, and it must depend upon other countries for its supplies. Upon the Peninsula of Jutland there are extensive dunes, which have in part been planted, but we did not find it convenient to visit them. Half a day of delay at Elsinore was made very agreeable through the courtesy of Mr. R. L. Ulstrop, our Vice-Consul, with whom we visited the Kronborg Castle, the Park, and other places of interest.

Crossing to Helsingborg in Sweden, we took the train next morning for Christiania in Norway, by the somewhat circuitous route of Hesselholm, Nassjo, Jönköping, and Laxa. The first part of this route passes near extensive coal mines, and through a wealthy agricultural district, but for the greater part of the way it is less inviting to Agriculture, and there are considerable tracts of woodland of small growth, with numerous lakes, marshes, and tracts of broken land.

But there was one point of this journey of special interest. The guide-book mentioned that Råshult, the birth-place of Linneas was near the railway, and that a view could be had of the obelisk erected in 1866, to mark the place. For some distance before coming to this place, the road was bordered with woodland; but soon openings began to appear, and then a gentle swell of land, with a green sloping lawn, a cottage with large trees behind it, and in front, there stood a polished shaft of dark-colored granite, surmounted by a golden star. The vision was for but an instant, but it left an impression that can never be forgotten. Here the great Linneas first saw the light of day; and we fancied him as an infant, wondering at the light patches of purple heather, and the wild flowers around the cottage door, or listening to the cricket on the hearth, or the birds that nested in the trees,—or leaning from his mother's arms as he gazed into the brook at the fishes, and the animal life therein, and then turning with a wondering look to his mother, as if asking, "*what does all this mean?*"

This journey, with the delays at Nassjo and Jönköping, requires about thirty-six hours. The latter, at the south end of Lake Wetter, is a city of some 13,000, on an important route of navigation across the country much traveled in summer. Here is an immense match-factory, using Poplar wood, and a material that can not be ignited excepting by friction upon a chemically prepared surface on the side of the box. They are used every-where in Europe, and are particularly commended among Foresters, from the security they afford against accidental forest-fires.

At Kongsvinger, the railway enters the valley of the Glommen, and upon a lofty eminence stands a fortress, now dismantled, that was once important in the wars between Sweden and Norway. For many hours we watched the timber floating down this river, which has a cold greenish look, and generally a rapid current, with occasionally a cascade of considerable beauty. The timber is all Pine and Spruce, stripped of its bark, and mostly cut as long as the tree will allow. It is generally small, as compared with our American timber, and is mostly cut up into lumber on arriving at Fredrikstad. The Glommen rises far to the north, toward the old city of Throndhjem, where anciently, and now by constitutional requirement, the Kings of Norway are crowned. This northern region, getting rain and warmth from the Gulf Stream, is milder than its latitude (63° 30′) would indicate, and some of the best timber of the country comes down this stream. There are however other important rivers that bring down large quantities of wood, as those supplying the market of Drammen, and other ports.

A railroad is nearly or quite completed from Throndhjem to Sundswall on the Gulf of Bothnia, which is expected to divert much of the timber of Northern Sweden to the former place.

Upon arriving at Christiania, we were greatly disappointed in not finding Mr. P. C. Asbjornsen, distinguished alike as a writer upon the Myths and Legends of the North, and as the author of various works upon Forestry, Peat, and the Natural Sciences. We had exchanged letters, documents and portraits, and it was with great regret that we learned of his absence. At the Forest Administration, we found various documents previously sent, and the utmost willingness to promote our inquiries.

There is no School of Forestry proper in Norway, and students resort either to Copenhagen or to Stockholm for an education. Already the government begins to feel the importance of conservation, and the maps received since our return, show that the timber-covered surface is by no means so great, as has been supposed, extensive areas being wholly barren, and others entirely cleared. There have been lately several Forest Schools, of elementary grade established, and several nurseries, where young plants are sold at cost. In the mountain regions, however, from where the Pine and Fir timber is brought, there is not much restoration going on, and a region once cut over is often overrun by fires, very much as in our own country. Having finished all that could be done, short of a personal visit to the forests, which would have taken several weeks of time, and after visiting the places of most interest at the Capital, we returned by the way we came as far as Laxa, and proceeded from thence to Stockholm.

THE AMERICAN FORESTRY CONGRESS:—MONTREAL MEETING.

(Continued from page 68.)

Proceedings of the Third Day.

FORESTRY CHAMBERS, MONTREAL, *Wednesday, Aug.* 23, 1882.

UPON assembling at half-past nine o'clock, the Hon. George Bryson, from the Committee appointed the day previous to report upon the subject of Forest-Fires, presented the following:

"This Committee recommends the following measures:

1. The reservation of all Pine and Spruce lands unfit for settlement, for lumbering purposes exclusively.

2. The prohibition of the burning of brush by settlers, in the vicinity of Fir Trees, during the months of May, June, September and October.

3. The division of the Timber country into Districts, and the appointment of a sufficient number of Police, the Superintendents of which force, to have ample magisterial powers, and whose duty it would be to detect and punish offenders, and to provide for the extinguishment of fires.

4. The cost of maintenance of this protective force, might partially be met by the imposition of a moderate tax on the parties who, owning or leasing large areas of forest property, are co-jointly with the respective governments, interested in its preservation."

These recommendations were approved by a vote of the Congress.

Mr. B. E, Fernow, from the Committee appointed to prepare amendments to the Constitution, presented the, following draft of a new Constitution, which was read and adopted:

CONSTITUTION.

ARTICLE 1. This Association shall be known as the AMERICAN FORESTRY CONGRESS.

ART. 2. The objects of this Congress shall be the discussion of subjects relating to Tree-planting; the conservation, management and renewal of forests; the climatic and other influences that affect their welfare; the collection of forest statistics, and the advancement of educational, legislative, or other measures tending to the promotion of these objects. It shall especially endeavor to centralize the work done and diffuse the knowledge gained.

ART. 3. Any person may be elected a member of this Congress upon the recommendation of two members, and the payment of two dollars. The annual fee shall be one dollar.

Art. 4. The officers of this Congress, to be elected at the annual meeting, shall be as follows:—President, First Vice-President, Second Vice-President, Recording Secretary, Corresponding Secretary, and Treasurer.

Art. 5. The President shall preside at all meetings of the Congress in general session, and deliver an annual address at the close of his term.

Art. 6. The Vice-Presidents, Secretaries and Treasurer shall constitute an Executive Committee for the transaction of such business as may be required by this constitution or by a vote of the Congress.

Art. 7. The Recording Secretary shall keep a record of the Proceedings of the Congress, and shall be custodian of all documents, books and collections ordered to be preserved.

Art. 8. The Corresponding Secretary shall conduct the correspondence of the Congress.

Art. 9. The Treasurer shall have charge of all funds, and pay out the same on the direction of the Executive Committee.

Art. 10. This Congress, at any regular meeting, or its Executive Committee in the intervals between its meetings, may appoint such local or special committees as may be deemed proper, and shall define their duties.

Art. 11. The annual meeting of the Congress shall be held in the month of August or September, at such times and places as shall be determined by a vote in general session.

Art. 12. At the close of each annual meeting, there shall be an election of officers for the ensuing year, and they shall remain in office until others are chosen. In cases of vacancies occurring in the intervals between the annual meetings, they may be filled by the Executive Committee until others be selected. In case of absence of an officer at a regular meeting, his place may be deemed vacant.

Art. 13. The officers of States, Territories, Provinces, or local Forestry Associations, or their Delegates, or the Delegates of any Government may participate in the proceedings of the Congress, as Honorary Members.

Art. 14. This Constitution may be amended by a two-thirds vote of the members present at any annual meeting.

Mr. D. W. Beadle presented the following draft of By-Laws, which was also adopted:

BY-LAWS.

1. Papers or abstracts of papers to be read must be sent two weeks before any meeting, for classification, to the Corresponding Secretary.

2. The following classification of subjects is adopted for the reading of papers:

Section A. Forest Planting, Forest Management, Forestry Proper, Preservation of Forests.

Sec. B. Forest Economy, Technology and Statistics.

Sec. C. Applied Science and Climatology, General Topics.

3. Contributors who are present shall have the preference in reading their papers.

4. Any member shall be entitled to the privilege of using any books or documents not of record, at the discretion of the Recording Secretary.

An election was then held for officers to fill vacancies occasioned by resignation, and the following persons were chosen:

First Vice-President.—Hon. H. G. Joly, of Quebec.
Second Vice-President.—Dr. John A. Warder, of North Bend, O.
Recording Secretary.—Dr. Franklin B. Hough, of Lowville, N. Y.
Corresponding Secretary.—Mr. William Little, of Montreal.
Treasurer.—Mr. Joseph S. Fay,* of Holmes Holl, Mass.

The Executive Committee were authorized to designate the time and place for the next annual meeting, and to appoint the Local Committees, and make such other arrangements as might be necessary for that occasion.

Upon motion of Mr. J. S. Hicks, the following Resolution was adopted:

"*Resolved*, That the Executive Committee appoint Referees to prepare papers upon the following subjects, and send them to the Corresponding Secretary like other papers:

1. Legislation in relation to Forest Fires.
2. Prevention and Control of Forest Fires.
3. Management of Burned Forests, and effect upon the soil, and Forest Growth.
4. Distribution of the White Pine.
5. Technology of the White Pine.
6. Forest Management of the White Pine."

Mr. Eleazer Wright presented a verbal statement concerning recent measures that had been adopted, and that were in course of execution, in Middlesex county, Mass., in Forest-tree Planting.

Upon motion of Mr. D. W. Beadle, the following resolution was adopted:

"*Whereas*, Many sections of our country are not represented in the American Forestry Congress, Therefore, *Resolved*, That the organization of local Forestry Associations be encouraged by this Congress, and that our constitution and papers be sent to persons interested in Forestry in these sections."

Resolutions were then passed, returning thanks to the Hon. Mr. Joly, for his services as presiding officer; to C. E. Belle, Crown Land Agent of Lower Ottawa Agency, Quebec,

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(*) Mr. Fay having declined the election by reason of full occupation in other affairs, the Executive Committee has since filled the vacancy, by appointing Dr. Charles Mohr, of Mobile, Ala., as Treasurer for the present year.

for the display of a fine collection of the woods of Canada; to the Ladies, for the interest manifested by them in the work of the Congress; to the Geological Survey of Canada, for the donation of a nearly complete series of its Maps and Reports; to the Montreal Amateur Athletic Association, for the tender of the use of their Rooms and Library; to gentlemen who had contributed papers for the meeting, but were prevented from attending; to the authorities of Government, who had done so much to render the meeting successful; to the Mayor of Montreal, and the citizens generally, for the interest taken by them in the proceedings; to the Press; to Railroad, Steamboat and Telegraph Lines that had extended facilities to the members; and to Mr. James Little, for earnest and persistent efforts he had made, from an early period, in the discussions which had largely contributed to the diffusion of knowledge upon the dangers that threatened our Timber-supplies, and that had in no small degree tended to the formation of public opinion, that now finds expression in the efforts of the American Forestry Congress. Finally, the thanks of the Congress were in the most especial manner expressed to Mr. William Little, Vice-President, for the earnest, energetic and efficient manner in which he had by his personal labors, his influence and his means, secured every preparation for the meeting that could be foreseen, and that had rendered it a complete success.

The Congress then adjourned.

The following papers were presented, but from want of time, were read only by their titles. Nearly all of them were soon afterward printed in the special numbers of the *Montreal Herald*, mentioned in our last number:

The Introduction of Trees and Shrubs at the Ontario Experimental Farm—*Prof. William Brown*, Guelph, Ont.
A few Thoughts on the necessity for a certain portion of each Farm being left in Forest……………………*J. Beaufort Hurlburt, LL.D.*, Ottawa, Ont.
Forest Economy of Canada……………………*Stewart Thayne*, Ottawa, Ont.
Experimental Plantation of the Eucalyptus, near Rome—*Franklin B. Hough*, Ph.D., Lowville, N. Y.
Lessons to be learned from the Forests of Western Asia—*Prof. H. S. Osborn*, Oxford, O.
How Farmers may grow Forest Trees from Seed—*D. W. Beadle*, St. Catharines.
Oaks of Hardin County, O……………………*W. F. English*, Mount Victory, O.
Timber Trees of the Black Hills……………*Robert Douglass*, Waukegan, Ill.

The Coniferous Trees of the United States and Canada—
Dr. Geo. Vasey, Botanist of Department of Agriculture, Washington, D. C.
Black-Locust Growths................*Dr. John A. Warder*, North Bend, Ohio.
Larchmere, a Plantation on Drifting Sands—
Dr. John A. Warder, North Bend, Ohio.
Classification of Oaks................*Dr. John A. Warder*, North Bend, Ohio.
A Western Greeting..................................*James T. Allan*, Omaha, Neb.
Forest-Tree Plantation...*B. F. Peck.*
Trees, Tree-Planting, etc....................*J. A. Mathewson*, Little Metis, Que.
Timber-Culture a National Necessity.................. *D. C. Scofield*, Elgin, Ill.
Rural Improvement..................................*B. G. Northrup*, Clinton, Conn.
Living Fence-Posts.......................... *William H. Ragan*, Clayton, Indiana.
Letter upon Forestry..*D'Ailly*, Malvern, Ark.
Fungi Injurious to Forest-Trees.................................*Byron D. Halsted.*
Forests in connection with Water, as aids to Climatic Amelioration—
T. T. Lyon, South Haven, Mich.
Forests of the United States, as shown by the Census of 1880—
N. H. Egleston, Williamstown, Mass.
Forest-cultural Survey, etc .... *General William Burns*, U. S. Army.
Economic Tree-planting; How and Where?...........*B. Gott*, Arkona, Ont.
The Mills of West Fork...................................*J. Jenkins*, Winona, O.
Individual effort in preserving and propagating Trees—
Dr. Reginald A. D. King, Compton, Que.
Profitable Forest-culture.............................*C. E. Thorne*, Springfield, O.
Canada's Forests, and her future as a Steel-producer—
Edward Haycock, Ottawa, Ont.
Climatological Range and Geographical Distribution of Forests, and the Climates favorable to them.....*J. Beaufort Hurlburt, LL.D.*, Ottawa, Ont.
Plan of Instruction in an American School of Forestry—
Prof. Adolph Leué, Cincinnati, Ohio.
The Relation of Forests to Agriculture—
A. G. Humphrey, M. D., Galesburg, Ill.
On the Needs of Forestry.....................*E. C. McGilliavray*, Ottawa, Ont.

The total number of persons who registered as attending, was four hundred and forty-five.

ON THE DISTRIBUTION OF THE MORE IMPORTANT FOREST TREES IN THE GULF REGION.

By CHARLES MOHR, Mobile, Ala.

(Continued from page 88.)

The Short-leaved, Soft, or Yellow Pine. (*Pinus mitis, Mx.*)

FROM the excellent qualities of this timber, its abundance, and wide distribution, this tree should rank next after the Long-leaf Pine. It extends southward as a straggler to lat. 30°, in the Eastern Gulf States, and westward to the headwaters of the Neechez River, in Texas. It is more or less associated with hard-wood trees, and sparingly with the Loblolly Pine. It forms definite forests on both sides of the Mississippi, which are important outside of the Long-leaved Pine belts, affording a valuable and often abundant timber supply. In mixed forests it takes a prominent place, and there attains its finest size. It is scattered through the oak woods of the table lands of Northern Alabama, and in the broken uplands of Mississippi and Northwestern Louisiana.

Upon the northern extension of the interior drift-belt of Alabama, ending in Northeastern Mississippi, it takes almost exclusively the place of the Long-leaved Pine. In that section its forests supply the demands of the trade along the Memphis and Charleston R. R., with an estimated area of 1,900 sq. miles, with a stand computed at 1,368,000,000 feet of lumber. The average yield of an acre does not exceed 1,500 feet. In Central Mississippi a belt of Short-leaved Pine mixed with hard-wood trees, and Loblolly Pine with its boundaries more or less vaguely defined, stretches from the region of mixed growth as an elongated triangle, to Tippah, near the northern limits of the State.

In Eastern Texas, it forms a more strictly defined region, covering about 9,000 square miles, and estimated at 26,093-000,000, feet and producing, in 1880, 26,000,000 feet of lumber.

This tree is spreading rapidly, within its limits; and succeeds almost entirely the original deciduous growth. It takes possession of old, worn-out fields, soon covering them with a dense and luxuriant growth Yielding no resinous products it is not exposed to the ruin caused in the production of naval stores.

Loblolly, or Old-field Pine; Rosmary Pine (*Pinus taeda*, L). This Pine is common from Eastern Texas, throughout the Gulf States. It is only there that it can be said to form a defined timber-region.

Adjoining there, the Long-leaved Pine region, extends west to the Trinity River; south to the prairies of the coast and north to lauitude 30°. Its western limit is found on an isolated patch of forest from 38 to 40 square miles, near Bastrop, Texas, forming the last representative in the Southwest of the Pines of Eastern North America. In Alabama it reaches northward to the valley of the Tennessee River, and in Mississippi to the northern limits of the State. This tree attains its best growth in the lower or coast Pine-belt of the Eastern Gulf States; on the slopes and higher banks of the streams in the Pine-barren region having a more retentive soil.

Trees from four to five feet in diameter, and the trunk clear of limbs, to a height of 70 or 80 feet, have been observed. Wherever available for transportation, such giants are highly prized for masts. It is of rapid growth; its wood is coarse-grained and sappy and its timber is of inferior quality and quick to decay. It is only used for inside work and inferior purposes.

Yielding resin abundantly, it is "boxed" wherever found, within the precincts of the Turpentine-orchard. In this lower Pine region, on the lands of better quality, it forms the larger part of the growth after the removal of the Long-leaved Pine, and takes possession of the old fields.

The Cuban, Slash, Swamp or Bastard Pine (*Pinus Cubensis*, H:-*Pinus Elliottii*, Engel). This fine tree, is strictly confined to the damp, flat-woods of the coast, particularly along the borders of bogs, and in the shallow swamps bordering the water-courses. Westward it does not extend beyond the Tangipahoa River. Its western limits is at the banks of Bogue Phalia, in Eastern Louisiana. It is most common eastward, and is the principal tree of the flat-woods of Florida. It exceeds in size the Long-leaved Pine, and trees upon tracts favorable to its growth, are generally from two to three feet and over in diameter, with a height of 100 feet or more. As it is but slightly resinous it escapes the axe of the turpentine-gatherers. As throughout the coast-plain, it takes the place of the Long-leaved Pine when removed; it can be said to be the forest-tree of the future in the eastern Gulf region. Large tracts are found covered with this second growth, already of size for lumber. It is of quicker growth, its wood is of a coarser grain, less compact and somewhat inferior in strength and perhaps also in durability, to that of the Long-leaved Pine; it furnishes, however, a timber which serves for all purposes in lighter constructions, and is much better than the Loblolly Pine.

At the saw-mills in Eastern Florida it commands the same price as the Yellow Pine.

Spruce-Pine (*Pinus glabra*). This tree is scarcely important for lumber. It is found in the damp, heavily timbered bottoms of a light more or less sandy soil lining the streams in the maritime Pine region of the Eastern Gulf States, as far south as the head of Mobile Bay and Gainesville, on the lower Pearl River, in Mississippi. It has not been observed west of the Amite River, and finds its most favored home in the region of "mixed growth." Trees have there been found, measuring over two feet in diameter, as on the banks of the Chickasawha, in Mississippi. Its northern range is the same as that of the Magnolia. Its timber is of no value, being of rapid growth, soft and rather light and perishable.

The young trees are employed as masts and spars, for the smaller coasting craft, on account of their lightness and elasticity.

Scrub or Mountain Pine (*Pinus inops*). This, in the Gulf States, is confined to the mountain region of Alabama and its variety, *P. inops* (*var.* "*clausa*"), to the barren, sandy wastes lining the coasts of Western Florida, eastward to the basin of the Perdido River. These trees, being of small size, and of no value, deserve no further mention.

Of other coniferous trees the following are found within the Gulf States:

The Hemlock (*Tsuga Canadensis*),[1] is found in the Gulf region only in rocky valleys, and gorges opening upon the valley of the Gipsy Fork of the Warrior River, in Winston county, Alabama, following that stream about twenty miles. It seems to be spreading, and its seedlings are found among the second growth in rocky recesses. Its sappy wood is not valued, and as it is of very limited amount, it can only supply bark to the local tanneries.

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[1] *Abies Canadensis* of Michaux.

The Cypress; Black Cypress; Red Cypress; Bald Cypress; (*Taxodium distichum.*) This, the largest of our conifers, and one of the most useful of the timber trees, is found throughout the whole extent of the Gulf region, westward to the very limits of arborescent growth. The most extensive and finest cypress brakes are found in the deep, gloomy and constantly inundated forest swamps lining the rivers in the alluvial region of the Lower Mississippi Valley and in the delta of Mobile River. In these Cypress swamps, the trees are found generally from three to five feet in diameter, and a hundred to a hundred and twenty feet in height; but much larger ones are found, reaching a diameter from eight to ten feet and over. Amongst the primeval growth, trees of smaller dimensions are not seen. It is only associated with the mighty *Tupelo* (*Nysa uniflora*), rivaling it in height, and under the somber shade, excepting the Carolina Swamp Ash (*Traxinus platycarpa*), no younger tree of its own or of any other kind has been allowed a chance in the struggle for existence. In the extensive Cypress brakes which cover the shallow lakes and swamps in the upper parts of the Mississippi and Yazoo delta, trees from three feet and over in diameter can be counted by the thousand.

There, they are mostly inaccessible by ordinary means, and the skill of the engineer and a vast outlay of capital are required to make these enormous timber resources available. The demand for its timber on account of its resistance to atmospheric influences, its compactness, strength and facility of working, is constantly increasing, and, in the localities easy of access, that permit the floating of logs in time of freshets, the tree is rapidly disappearing.

In the delta of the Mobile River, and the swamps in the bottoms of the Alabama and Tombigbee Rivers, the amount of Cypress timber standing at the end of 1880 has, by an actual count of the trees, been ascertained to be equal to sixty-six millions of feet of lumber, of which about fifty per cent can be regarded as of first quality. There it can truly be said, that the days of these giants of the forest are numbered. The age of the trees of average size from three and a half to four feet varies from 400 to 450 years.

Its timber is subject to a defect, in being what is called by lumbermen "peggy," that detracts much from its value. During the best periods of its growth, the interior is often found perforated by numerous oblong holes, with rounded and perfectly smooth walls, running more or less parallel with each other, and never reaching the younger wood. They are often found so numerous that they render the wood almost honeycombed, and, by coalescing from larger cavities, which in the upper part of the trunk, if accidentally brought to the outside, as by the breaking of limbs or by strokes of lightning, admit the water and lead to the decay of the best part of the tree.

The Cypress in the shallow sandy swamps of the smaller Pine-barren streams, and less subject to continual overflow, is of a slower growth and a more compact wood, being heavier than water, in the living tree. For floating, it must be deadened, and left standing for a season or two before being filled.

The Black or Heavy Cypress, on account of its greater strength and durability under the exposure to moisture, is much esteemed for heavy constructions, particularly bridges, acqueducts, and other places exposed to dampness. The trees of this variety are rarely found exceeding the average forest tree of larger size. The smaller trees are much used for fence-posts, railroad-ties, and various under-ground work. The manufacture of Cypress lumber is chiefly carried on in Vicksburg and Greenville, Miss.; in New Orleans, La.; the counties of Stockton and Mobile, in Ala.; and, to a smaller extent, in Apalachicola, Fla.

White Cedar: "Juniper" of the Gulf States (*Chamæcyparis sphæroidea spach; Cupressees thyoides*, L.) This interesting and valuable tree is chiefly confined to the coast region east of the Mississippi, and has not been observed in Western Louisiana, nor in Texas. It is found abundantly in the swamps of the lower Alabama and Tombigbee rivers, which are submerged for the greater part of the year, and, in the deep, inundated swamps and hammocks of the Pine barrens. It averages about sixteen inches in diameter, with a height from seventy to eighty feet, affording a lasting supply of excellent timber. It is light, soft, fine-grained, and is very durable, easily worked, and admitting of a good finish. It is particularly valuable for the finer kinds of hollow-ware, and is much esteemed for ship-building and shingles.

The Red Cedar (*Juniperus Virginiana*). This tree is found scattered throughout the Gulf region to the valley of the Colorado River in Texas.

It generally prefers a dry rocky calcareous soil, and forms woods of more or less extent on the limestone region ridges of the interior. On the hill lands in the limestone region it largely succeeds where the original growth is cut off, forming dense copses, fit only for posts and other uses ordinarily. Its timber is particularly valuable on account of its durability when exposed to moisture and the attacks of insects. Considerable quantities of fair quality are found in Central Alabama and in the limestone valleys of the northern part. The finest qualities for pencils are scarce, and are only found in the swampy forests bordering the larger streams in Western Florida, as on the Chattahoochee River. The large tracts once covering the eastern slope of the valley of the Brazos have disappeared.

The Western Cedar (*Juniperus occidentalis*, var. *conjugens.*) This occurs on the extreme western limits of the eastern North American forest-region, extending from the valley of the Colorado in Texas throughout the western part of the State, where it is confined to the arid rocky limestone ridges of the table lands. It seldom reaches the size of the eastern species, rarely exceeds twelve or fifteen inches, but is of much strength and the greatest durability. Its timber is highly prized for piling, posts, etc., and particularly in a country almost devoid of a larger useful timber growth.

The production of merchantable Cypress lumber in the region of the lower Alabama and Tombigbee rivers during the business year ending September, 1882, amounted to a little over twelve millions of feet. The demand for better qualities is constantly increasing, and prices correspondingly advance. At present, first-class Cypress lumber sells at from $20 to $25 per M. at the mills, according to size.

The manufacture of Cypress shingles has of late, with the introduction of improved machinery, greatly increased. The machine-made shingles, being smooth and of uniform size, are rapidly superseding those made by hand. A great saving is effected in the production of shingles of lower grade by the aid of machinery from the refuse of the saw-mills, which was formerly wasted. Such shingles find a ready sale at $1.50 to $1.75 per M. for the roofing of cheaper and merely temporary structures. Those of prime quality command from $2.75 to $3.00 per M., and last from twenty to twenty-five years. During the past business year, over twenty millions of Cypress shingles were produced at the mills, and in the yards of Mobile and of Baldwin county, requiring nearly five millions of cubic feet of lumber. Of these, from sixteen to eighteen millions were shipped by rail to the interior of Alabama, Mississippi and Georgia, and to Cincinnati, Ohio; about two and a half millions to foreign countries, and the balance to domestic ports. With the increasing scarcity of the timber in the swamps of the lower alluvial region, the supply is drawn from the less extensive swamps with detached Cypress brakes occurring as far north as the central part of the State.

THE DUNES OF LAKE MICHIGAN.

BY V. M. SPALDING, ACTING PROFESSOR OF BOTANY IN THE UNIVERSITY OF MICHIGAN, ANN ARBOR.

ALONG a great part of the eastern shore of Lake Michigan, from its southern extremity to Manistee and northward, there extend irregular and variously broken ridges of sand, that have been thrown up by the waves, and afterward blown by the winds like drifting snow, and finally deposited in their present form. These dunes are confined, for the most part, to the immediate vicinity of the lake. At Grand Haven, for example, where some of the most perfect formations of this kind are to be seen, they do not extend back more than a mile from the shore, the country beyond them being a level plain, divided up into farms; while in other places they are still more narrow and seem like a single great dyke or breastwork thrown up by nature to protect the lands behind them from some invading force.

The process of formation is gradual, and can be traced step by step by observing what is now going on near the shore.* At first the mounds and ridges are small, a few feet only in diameter and height, but by the continued drifting, that goes on from year to year, they have attained their present dimensions. At first, too, the sands are loose and bare, but in the course of a few years, quite a variety of plants have established themselves on this uncertain foundation. The Sea Rocket, (*Cakile Americana*), Wild Wormwood, (*Artemisia Canadensis*), Bug-Seed, (*Coriospermum hyssopifolium*), a Spurge, (*Euphobia polygonifolia*), and a few other species were noticed growing on the recently formed banks that were otherwise bare of vegetation. These are followed by several species of grasses and willows. The Sand Cherry (*Prunus pumila*), and the Aspen (*Populus tremuloides*) very soon add their forces in the grand effort to subdue and control the sandy waste. Vegetable mold slowly accumulatess, and at last, by the time the dunes have reached their present form and size, they are covered by a forest, whose variety and vigorous growth can not fail to awaken surprise when the unsubstantial nature of its soil is taken into consideration. While on one of these ridges, at a point fifty or sixty feet above the level of the lake, I sat down on a fallen log, and, without rising from my place, noted Hemlock, Sugar Maple, Beech, Black Cherry, White Pine, Red Oak and other trees, and the usual variety of shrubs and herbaceous plants to be found in our northern woods. A Basswood, near by, measured a foot and a half in diameter, and the other trees mentioned were of a fair, though not extraordinary, size.

In this way nature has provided a perfect means of holding the dunes in their place, and as the whole operation has been completed without the agency of man, long before the day of railroads and harbor improvements, and has served the purpose of protection so satisfactorily, it is not strange that the protecting barrier has not been cared for and cherished as its great value and importance require. In other countries the people "talk of their fringe of sand hills as if it were a border set with pearls. He who is lucky enough to own a mole-hill of dune pets it affectionately, and spends his substance in cherishing and fattening it." But the citizens of Western Michigan have no extravagant reverence for *their* sand hills. Trees growing upon them have been cut down for fuel or railroad ties, and the banks have here and there been broken into for the purpose of making "improvements." No very disastrous consequences have followed thus far, but indications are not wanting of the nature of the results that may be expected should such operations become general.

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*The descriptions are based upon personal observations at Grand Haven and other places on the eastern and southern shores of Lake Michigan in August, 1882.

At Grand Haven, some years ago, the Detroit and Milwaukee railroad company found it necessary to cut away a portion of the ridge extending along the left bank of the river where their track was subsequently laid. As a result, the light sands, laid bare to the strong winds that sweep into the mouth of the river, have drifted over certain portions of the south end of the town, where they have been piled up like great snow-banks, and walking along upon them one can look down into the chamber-windows of houses that are undergoing the gradual process of being buried. On the other side of the river, the drifting has occasioned still more damage, having covered completely the railroad track and adjacent buildings, necessitating the removal of the depot to another point. At this place, a system of wind-breaks has been built by the general government at considerable expense, which have to some extent checked the shifting of the sands, without, however, completely controlling them. At Michigan City, Indiana, huge banks of light sand have accumulated near the railroad station, and have occasioned inconvenience by covering the tracks and necessitating their being cleared from time to time. Buildings near by are partially buried, and lots farther back in the town have been completely covered. It has been proposed to wash into the lake, by means of a hydraulic apparatus, the large bank on the north side of the town known as "Hoosiers' Slide," which is almost entirely bare of vegetation, and portions of which are continually blown upon the tracks and buildings near it. Still, notwithstanding the inconvenience and loss already experienced, no serious effort has been made to control the dunes at this place, and from the remaining stumps of trees that have been cut near the lake, it may be inferred that human agency is, to some extent at least, responsible for the existing state of things. Between St. Joseph and Benton Harbor, the track of the Chicago and West Michigan Railroad lies along one of these banks, and at the former place, the railroad company have been obliged to build fences and barriers of considerable extent, to prevent the encroachment of the sand, its accumulations having increased in size and advanced landward within a few years.

While it may be impossible to ascertain in each case how far the shifting of the sands has been occasioned by human interference, the situation at these and other places along the shore, shows that it may be, and in prominent instances has been, brought about by removing vegetation, and otherwise disturbing the natural order of things. It becomes, therefore, a matter of practical importance, to ascertain if possible, whether such interference is likely to prove to any considerable extent disastrous to the region in the vicinity of the dunes, and if so, to determine the means of prevention.

It may be stated at the outset, that there is no probability of any such extensive destruction of property in the vicinity of Lake Michigan, as has resulted in Western Europe from the shifting of the dunes, and extensive encroachment of the sands composing them. The dunes of Michigan are already covered with trees and shrubs which control them perfectly, and for the present, at least, there is very little inducement to clear these away. The land is not valuable, and when timber is cut, it is mostly the larger trees which, if not thinned out too closely, will usually be replaced by younger ones. It can not be doubted, however, that the complete clearing of any portion of the dunes—a thing that may happen any time, when the growing scarcity of timber makes it an inducement, would result in the loosening of the sands, and the covering up of land in their vicinity. The extent to which such a region as the fruit belt of Michigan would be damaged by an inroad of this kind may be guessed at. It is hardly worth while to perform the experiment for the purpose of developing more exact facts.

In a few cases, as already shown, the dunes are now in a shifting and unsettled condition, which has made it necessary to employ artificial means for their confinement. The general government, in connection with the harbor improvement at Muskegon, Grand Haven, Holland and other places along the coast, has recently erected barriers designed to aid in controlling the drifting sands, and permanently fixing them. These barriers are built like a steep roof, measuring about twelve feet along the slant, from base to ridge, and boarded on one side. They are erected at considerable cost, and when covered by the drifting sands have to be left where they are, unless the expensive work of excavation and removal is resorted to. A much simpler form of barrier is that employed, after numerous experiments, on the western coast of France. Palings about four and one-half feet long and half a foot wide, are sharpened at one end and driven into the sand. The boards then stand in line, with a space of an inch between them. They are gradually covered by the sand and are lifted by means of a lever, the operation being repeated until the bank has reached the desired height and is controlled by the vegetation that meanwhile has been induced to grow there. A modification of this method, with the use, perhaps, of longer palings, might be found quite as serviceable as those employed by our government, with the advantage, at the same time, of being far less expensive.

In all operations of this kind that have been carried on in Western Europe, the growth of plants of various sorts, is one of the principal means depended upon, and it is to this same agency, that we are to look chiefly, for the permanent restoration of such parts of the dunes as have been broken into, and are now in an unsettled condition. The officers in charge of the harbor improvements along the eastern shore of Lake Michigan, have recognized the value of this means of control, and have already set out, in a few places at least, Willow cuttings, and have sowed "Utah clover" as an experiment. The latter failed to come up, but the Willows are growing, and will doubtless prove serviceable in the low ground where they have been set; but those noticed at Grand Haven on the flat in front of the light-house, are of a kind (*Salix viminalis*) that would probably fail on the light dry sands of the more elevated banks.

Where dunes have been successfully fixed by the growth of vegetation, as has been done in the west of France, those kinds of plants have been employed that grow there naturally and have already proven themselves adapted to their shifting foothold. Those species are especially valuable for this purpose that throw out long creeping stems at or just below the surface, and also such as are capable of healthy growth when half buried by the encroaching sand. One or both of these conditions are fulfilled by a half dozen species of plants that grow along the shore of Lake Michigan abundantly and vigorously in the loose sands. There are two species of Sand-Reed, (*Calamagrostis arenaria*, and *C. longifolia*), the Sand Cherry, (*Prunus pumila*), and three Willows, (*Salix longifolia*, *S. adenophylla*, and *S. glaucophylla*), all of which were found last summer growing luxuriantly on the sand banks near Grand Haven, and, wherever they had gained a foothold, binding them together more firmly than any artificial means could possibly do. If clumps of these grasses were dug up and planted and cuttings from the willows set in a wet time in all those places where it has been found most desirable and at the same time most difficult to control the sands, there is every reason to believe that this means in connection with the use of the simple barriers of palings already described, would prove more effectual than the expensive structures that have thus far been employed.

In the sketch that has been given of the present condition of the dunes of Western Michigan it has been shown that they are now fixed throughout nearly this whole extent by a comparatively heavy growth of vegetation, and that so long as this is preserved their permanence may be expected. On the other hand, from what has occurred at several places along the line, it is evident that the removal of trees and other vegetation, and especially cutting into the banks, will be followed by their loosening and shifting, and that if such a practice became general the adjacent regions would be in danger of being buried beneath the drifting sand. Lastly, wherever it is necessary to confine sands that are already in an insecure condition, the use of a simple barrier of palings that can be lifted as they become partially covered, in connection with the setting of suitable kinds of plants, indigenous to the dunes, is the natural method of procedure and the one that has already proven entirely successful elsewhere.

THE CONIFERÆ OF THE UNITED STATES AND CANADA.

A Paper read before the American Forestry Congress at Cincinnati, April 28, 1882, by DR. GEO. VASEY, Botanist to the Department of Agriculture, Washington, D. C.

THIS important and pre-eminently useful order of plants has a very wide distribution, and includes not only those forms with which we are familiar, as the Pines, Firs, Cedars, etc., but others equally important although very different forms in the Southern Hemisphere, as the *Araucarias* of South America and Australia, and the *Podocarpus* of New Zealand and Java, which are said to be among the most valuable timber trees of the world. Even in the Northern Hemisphere, there are several genera which are not represented in North America, as a Cedar of Lebanon, which is found in Western Asia, and the *Ginkgo* and *Cryptomeria*, in China.

The conifers have essentially the same kind of woody structure as other exogenous trees, viz: annual concentric layers of woody tissue with a central pith, and radiating lines of medullary substance. An important distinction, however, is found in the abundance of peculiar bordered pits, or circular openings, which occur in the woody fiber of coniferous trees. These are so universal and so characteristic, that they form an important microscopic test; observable even in fossilized wood, and in the coal which has been formed from trees of this order.

In the wood and bark of most conifers also there are found a great abundance of intercellular canals, which contain the peculiar terebinthinate sections so characteristic of this family. In some species of Pine, the wood is so impregnated with these secretions that they are the source from which we obtain the turpentine, tar and resin, of commerce. Other trees of the order furnish Venice turpentine, Burgundy pitch, Canada balsam, etc.

Not only do resin-ducts occur in the wood and bark of conifers, but in many, and in all, the Pines they occur also, with great regularity in number and arrangement in the leaves.

Conifers have a wide geographical range, from the inclement climate of Arctic regions to the hottest part of the Indian Archipelago; from the highest limit of tree growth on mountain ranges to the level of the sea. No other order of trees can be compared to this, in regard to its timber and useful products. The immense forests which prevail in temperate climates have yielded vast quantities of light, strong and durable timber for the construction of ships, houses, implements and fences.

Without the timber these forests have furnished, the progress of settlement and the astonishing advance of civilization in our country would have been greatly retarded, and we stand in imminent danger of eventually losing all the advantages we have obtained by our reckless and unthinking destruction of those forests, without taking adequate measures for their renewal and future continuation.

The leaves of conifers are very variable in character; in some they are small and scale like, as in the Arbor-Vitae and Juniper; in others, they are narrowly linear, as in the Spruces and Yews; elongated and needle like, as in the Pines; or in the Ginkgo of China, expanded and two-lobed, with parallel venation.

A few conifers have deciduous leaves, as the Larch and Southern Cypress, but in the majority of species the leaves persist for one or for several years; in some Pines for ten years or more.

In a botanical point of view, the chief distinctive features of the conifers are to be found in the organs of reproduction. In this order, the two sexes are always separate, either in distinct aggregations on the same plant or tree, or sometimes on separate trees.

Both the male and female organs are destitute of the ordinary floral envelopes which give beauty to other plants.

But, as they are fertilized through the agency of the wind, they have no occasion to hang out a conspicuous banner to attract the attention and secure the services of insects.

The male organs, or stamens, are collected in masses of greater or less size, in what are called aments. The pollen differs from that of other flowering plants, in having a lobed character; that of Pines being two-lobed. The lobes are said to contain air, which probably serves the purpose of giving buoyancy, so that it may be carried by the wind for the fertilization of the female flowers. If a storm happens to occur at the time of the ripening of the pollen, it is often carried in clouds to great distances. It is then frequently thrown to the ground by rain, in such quantities as to give rise to what are called "showers of sulphur."

In order to understand the character of the female flowers, let us examine the structure of an ordinary Pine cone. This we see is made up of a mass of flattened woody scales, arranged in a spiral manner, at very regular distances. If we examine more closely, we shall find underneath each one of these woody scales another smaller scale of similar texture. This smaller scale is called a "bract." In some genera it is very largely developed, and in others it almost disappears. Let us look now at the upper surface of each of the scales, and we shall find two, more or less distinctly marked depressions, running from the base toward the apex of the scale. These depressions are the beds in which the seeds were fostered and nourished, from the minute embryos of the incipient cone. If we examine a young cone, we shall find these seeds side by side on the surface of the scale. When the cones are mature, the scales expand and liberate the seeds.

It now becomes important for us to know that these seeds of the conifers are essentially different from those of other exogenous plants. The seeds of the Pea, the Rose, the Apple, Melon, etc., are contained within a closed sack or envelope, which is called a pericarp, and the fertilization of the ovules or young seeds is effected through the agency of a stigma and style.

But in conifers, the young ovules are not provided with a pericarp; they are naked ovules, developed on the expanded scales, and in the young state are fertilized by the application of the pollen directly to the ovules, without the intervention of a stigma or style. Hence, the conifers belong to a class called "Gymnosperms," or naked seeds.

In the structure of the cone and in the naked ovules, they are analogous to the higher Lycopods, or Club Mosses, the scales of the one corresponding to the modified leaves of the other, and the naked ovules of one to the macrospores of the other. The Lycopods of the present time are small plants, but in the carboniferous age they would vie with the Pines of the present time. But, although there is analogy of structure in the fructification, there is yet a wide difference between the seed of the conifer, with its perfect embryo, and the homogeneous macrosperm of the Lycopodium.

One other characteristic of conifers we must notice: in germination, the seeds do not develop a single cotyledon, like the Endogens, nor a pair of cotyledons, like the Angiospermous Exogens; but they usually produce from six to ten cotyledonous leaves.

Subdivisions of the Order. According to the most recent authorities, this order is subdivided into four tribes, viz: 1. *Abietinæ*, including the Pines, Firs, Larches, etc.; 2. *Cupressineæ*, including the Arbor-Vitæs, Cupressus, Junipers, etc.; 3. *Taxodiæ*, including the Taxodium and Sequoias; and, 4. *Taxaceæ*, including the Yews; but we will not at present discuss the character of the tribes, but will pass at once to a consideration of the genera.

1st. *Of the genus Pinus.*

In this genus, the cones are composed of a large number of scales, (called carpellary scales) spirally arranged, each scale supporting a pair of inverted ovules; the bracts are usually but little developed, and both scales and bracts are persistent to the axis after maturity. The cones mature at the end of the second year, or sometimes later, and may either fall from the tree at that time, or, in some species, they remain attached to the tree for many years; sometimes they persist after having opened out and shed their seeds; in other cases they remain several years in a closed state, the seeds retaining their vitality until they are dropped by the expansion of the cone.

The leaves are collected in fascicles of from two to five, (although in one species they are single) and are bound together at the base by a number of membraneceous scales, or modified leaves. The leaves vary in length in different species, from one and a half inches to sixteen. They contain resin-ducts or canals, which have been made the subject of careful microscopic study, and it is found that the number and position of these ducts are so regular and constant in different species, as to be of great importance in their classification and determination.

Sections. The genus is subdivided into two sections. 1st Section, *Strobus*, or White Pines, in which the scales of the cones are comparatively thin, especially at the extremity, and are smooth and without prickles or protuberances, and the leaves are in fascicles of fives; this section includes *Pinus strobus*, *P. monticola*, *P. Lambertiana* *P. flexilis*, and *P. deflexa*.

2d Section, *Pinaster*, embracing the rest of the genus, in which the scales are generally more thickened, and the apex has a definite elevation called the *umbo*, which is sometimes much enlarged, and frequently armed with a stout prickle or thorn, or a horn-like point or hook.

The number of species of Pines known is about seventy, inhabiting chiefly the Northern Hemisphere; of these there are in the United States and Canada, about thirty species, and, if we add the sixteen or seventeen species peculiar of Mexico and the West Indies, it will give to the New World a considerable preponderance of all the number.

It will not be possible here to go into an extended account of species, but, in the briefest manner, I will give their names and general range.

In the eastern portion of the Continent we have about a dozen species. In the northern part of this section, including Canada, the New England States, and parts of New York, Michigan and Wisconsin, we have four species; the White Pine, (*Pinus strobus*) the Red Pine, improperly called "Norway Pine," (*P. resinosa*,) Pitch Pine, (*P. rigida*), and Bank's Pine, (*P. Banksiana*). Of these the White and the Red Pines, furnish the great bulk of the Pine lumber of the Northern States.

The northern limit of the White Pine passes, according to the excellent paper of Dr. Rob't. Bell, not much above the 50th degree of North Latitude, extending west nearly to Lake Winnipeg, east to Newfoundland and New Brunswick, and southward chiefly along the Canadian border from Minnesota to New England, and also southward in the Alleghenies to Northern Georgia. It forms, or did at one time form, extensive forests in the above area, particularly about the Great Lakes, in the mountains of New Hampshire and Maine, and on the headwaters of the Hudson, the Susquehanna and the Delaware. It has been of the greatest commercial importance during the last fifty years, and so vigorous has been the inroads into its strongholds that the question of future supply has become a somewhat alarming one.

(*To be continued in the next number.*)

MISCELLANY.

The Russian Mulberry.—It was stated in a paper from D. C. Burson, of Kansas, read at the American Forestry Congress, at Montreal, in August last, that this tree was brought to this country from Western Russia, and as nearly as he could learn, through E. H. Rondebush, who got a quantity of seed direct from Russia, last season. It is thought to be a cross between the *Morus nigra*, or Black Mulberry, and *M. Tartarica*, a native Russian species. Of its qualities, he says:

> "It is a rapid grower and stands transplanting almost equal to the Cottonwood, but its great superiority over the Cottonwood is that its timber is valuable, the tree ornamental, and the fruit useful. The timber is used in manufacturing of cabinet-ware, and for durability as a fence post it is not surpassed even by the Catalpa, or Red Cedar. It commences bearing at two years old, and is very productive. The fruit, which is about the size of blackberries, has a sub-acid, sweet taste, and is used for dessert; it also makes a pleasant light wine, and the leaves are largely used for silk-worm food. As to the rapidity of its growth, trees, the seed of which were planted seven years ago, are now twenty-five feet in height, and from six to eight inches in diameter. They grow to be very large, often sixty feet high and from three to four feet in diameter."

The Growth of Poplar Trees for the Manufacture of Paper and Charcoal. By William Saunders, of London, Ont.—Within the past few years the consumption of the wood of several species of Poplars for paper-making has greatly enhanced the value of these trees, and so extensive has been the demand, that in many sections it has been difficult to supply it from the immediate neighborhood, and this wood, hitherto of little value, now commands a price nearly or quite equal to the more valuable sorts. The species which have up to the present time furnished the bulk of the wood used in paper-making are the Aspen, or Trembling-Leaved Poplar, (*Populus tremuloides*), and the Silver-Leaved Poplar, or Abele of Europe (*P. alba.*) These have also been used to some extent by charcoal-makers, and are found to produce a superior quality of charcoal. Doubtless the Large-Toothed Poplar (*P. grandidentata*), and the Cottonwood of the Northwest (*P. monilifera*), and probably the Balsam Poplar (*P. balsamifera*), being similar in their structure and characteristics, will prove almost, if not quite equal in value to the two species first named.

These trees are of very rapid growth; most of them thrive on inferior soils, and are capable of cultivation in almost all the settled portions of the Dominion. The Aspen is said to be the most widely diffused tree of North America, and one of the most abundant in the Far West, where it ranges from the Arctic regions to California. It extends over the southern half of the Labrador Peninsula, and is common throughout the whole region from the Gulf of the St. Lawrence near the mouth of the Mackenzie River, about latitude 67°. Throughout the Northwestern Territories it is the commonest tree in the partly-wooded and prairie districts, and is the chief fuel used at the Hudson Bay Company's posts and by the Indians. The quantities of this wood existing in the forests throughont this vast area are immense.

The Balsam Poplar is distributed over an area almost as great as that of the Aspen, extending to about the same point north, and about Lakes Huron and and Superior and in the valley of the Mackenzie River attains a large size.

The Large-Toothed Poplar does not range nearly so far north, but is abundant in New Brunswick and Gaspe, and is found in most parts of Ontario and Quebec.

The Cottonwood is very common throughout a large portion of the Northwest Territories, where it is the chief source of fuel for the settler.

The Silver-Leaved Poplar was introduced as an ornamental tree from Europe, and the rapidity of its growth and beauty of its foliage induced many to plant it. It will thrive well in waste places and in the poorest soil. While young it forms a rather pretty tree, but becomes ungainly as it grows older, and its persistent habit of sending up suckers from the roots has almost led to its abandonment for ornamental purposes. Wherever this tree has been planted throughout the Northern United States and Canada, it has, as far as it is known, proved hardy, and in rapidity of growth it has few equals—the trunk often attaining a diameter of two feet within fifteen years. Isolated trees usually have low and wide-spreading heads, but closely-planted in groves they run up tall and straight, and the poles taken out in thinning can be turned to many useful purposes, and the tree when grown, converted into useful lumber for building purposes where other timber is scarce.

Poplar trees may be grown from cuttings, suckers, or from the seed contained in the catkins. Cuttings may be made from two or three to five or six feet in length, and from an inch to two or three inches in diameter. They should be taken from the young wood, and the larger end sharpened by a sloping cut on one side to expose the bark. Suckers can usually be obtained with a small proportion of root and grow very readily; cuttings, suckers and young trees should be planted four feet apart. If young trees are to be raised from seed the catkins should be gathered in June, the seed rubbed out with the hand, and mixed with sand to facilitate even sowing, planted in drills on mellow, moist soil from half an inch to an inch deep, and kept free from weeds during the summer; the young trees will be ready for planting the following season.

On most farms there are waste places, broken land, or small areas of poor soil unsuited for general agricultural purposes; probably nothing could be used to occupy so profitably such waste places as Poplar trees. In addition to the value of the thinnings while growing and such portions of the wood as the owner may choose to sell when grown he might enjoy all the advantages resulting from adjacent forest growth. Such clumps or belts would act as useful wind-breaks, protecting the crops in adjoining fields; they would help to equalize violent alternations of heat and cold, exercise a conservative influence on the humidity of the atmosphere, aid in inducing rain-fall and in purifying the soil and air.

In the discussion upon this paper, Prof. Fernow said, the Poplar made charcoal good for the manufacture of gunpowder, but very poor for smelting purposes. The Poplar tree impoverished the soil very soon and should be planted with other trees.

Mr. Butler said in Southeastern

Indiana they used the Buckeye and common Cottonwood for making paper.

Hon. Mr. Bryson said that the Black Willow made the best charcoal for smelting purposes.

Dr. Hough remarked that the best rifle-powder in the world, was made from the charcoal of the *Rhamnus frangula*, known in the English markets as "Dogwood," and by the French as "*Bourdaine*."

Experiments in Tree-Planting on Cape Cod. By Joseph S. Fay.—The soil of Cape Cod is simply and purely *diluvian* or drift, and at best a light sandy loam, with little or no clay any-where. Yet it has been, no doubt, well-wooded with Oak, Hickory and Pine in the time past, and has now its fair proportion of forest. Formerly this has afforded some ship timber, but of late it has been mainly utilized for fuel, and when cut off for this purpose, the trees have grown up again, to be again cut off at regular periods. Of course, from this there can be no production of timber or lumber. Until the last forty years, the keeping of sheep has been inimical to fresh forest growth, but since then that industry has been almost entirely abandoned, and attention has been given to using some of the vacant lands for tree-planting. This has for the most part been done with the seed of the native Pitch Pine (*Pinus rigida*), and seemed for a time to be quite a success. Unfortunately, in addition to the disasters incident to forest-fires, carelessly or wantonly set, this Pine has become subject to a blight, said to be a fungus, which attacks the foliage of the young growth, spreading and destroying the trees, so that the hopes of the planter have been grievously disappointed. This has been the case also on the Island of Nantucket. Experiments have been made quite extensively, within the last twenty years at Wood's Holl, the southwest extremity of the cape, with the Scotch Pine, planted from the seed, on old worn-out pasture land. So far, the promise is very good, as the blight, or fungus, which is destroying the Pitch Pine does not seem to touch it. The tree, so far, appears to be a rapid and healthy grower, but, of course, its value for timber or lumber can not be fixed for some years yet. It bears a severe exposure, but more trees are broken off by gales of wind than among our native Pines, although this may be accidental or exceptional. The native Pine seeds have usually been planted by dropping them in light furrows, run six, eight or ten feet apart, according to the supply of seed. If coming up too thickly, the surplus may be transplanted or cut out. They, as well as the Scotch Pine, are also sometimes sown broadcast and do well. If done when there is a light snow on the ground in the spring, there is less likelihood of their being sown too thickly. The White Pine will not do well where it is likely to be reached by the winds blowing from the sea, as the salt affects the foliage injuriously. Experiments have been begun with the Red Pine (*Pinus resinosa*) which is a desirable tree for any part of the country. It is very handsome, and is a fair substitute for the southern Yellow Pine. It deserves attention. The European Larch and Scotch Birch have been somewhat planted and are doing well. They are hardy and rapid growers. The former are now planted from seedlings obtained at the West The earlier ones come from England. The latter come from abroad, and are already quite large trees. The Catalpa seems to have done well, and there are some handsome well-grown specimens introduced from the seed some forty years ago, which encourage the more extensive plantings now beginning to be made. From present appearances there seems to be nothing that will reward labor and capital better than the systematic cultivation of trees on the light lands of this region, the more so as they are of little value for any other purpose. Attention is being more and more given to it.

The Turpentine Forests of the South.—Dr. Mohr, whose articles upon the Forests of the South, are being printed in this journal, in a letter written Nov. 10, 1882, after returning from a recent journey, says:

> "I find that the Pine forests have been of late fearfully invaded by the turpentine-men, and it is safe to say, that since the time of my report to the Census on the subject, 150,000, if not 200,000 acres of Pine lands have been given up to destruction. The ruling of high prices, by the very acquisition of the Pine lands, and the steady advance in the construction of railroad lines through the Pine regions have stimulated the production of naval stores to a degree that it is certain to involve the destruction of the timber resources of the great Maritime belt from the Chatahoochee River to the Mississippi, within a much shorter period than was ever anticipated. Our saw-mill men, and dealers in lumber are getting greatly alarmed about this prospect before them, and in vain the question is raised, as to *how this evil can be prevented before it is too late.* In regions most accessible to lines of communication, it is, alas! already too late!"

After specifying certain regions soon to be traversed by railroads and then speedily denuded of their forests, embracing some of the best of the Pine lands of the South, he adds:

> "It is appalling to contemplate such devastation of resources having immense value, for the mercenary gain of a few. The general government should stop selling, or otherwise disposing of its domain in these districts, the land itself being of little value to the poorer class of settlers who intend to farm them with but slender means."

Forests, in Connection with Water, as Aids to Climatic Amelioration. By T. T. LYON, of South Haven, Mich.—It may, doubtless, be safely assumed, that the climatic peculiarities essential to the growth of forests are equally potential in the growth of the products of agriculture, with the possible exception of certain considerations consequent upon latitude.

So far as marine or lacustrine exposures are concerned, their beneficial influence must depend upon their bearing upon the equalization of temperatures and the supply of moisture. These, in their turn, will as surely depend upon the question whether or not the winds which bring the paroxysms of winter cold, pass, previously over broad areas of unfrozen water, or their at least partial equivalent, extensive forests; and, on the other hand, whether moisture-bearing winds come from the same direction, or from the hills and forests of a more elevated region to which they shall have previously yielded their accumulated burthen.

A most striking illustration of the influences of this combination of circumstances upon the deposition of moisture, occurs in equatorial South America. The immense valley of the Amazon teems with moisture deposited by the easterly trade winds; while these same winds, having yielded the last of their accumulations in passing the cold peaks of the Andes, pass over the narrow western slope of the continent with scarcely even a deposit of dew.

Although this branch of the subject affords abundant material for further illustration, time will not suffice for its elaboration; hence, we pass to other and diverse considerations, more directly associated with the points to be discussed.

The temperature and moisture of the air, rather than its rate of motion, are the specially important conditions of the problem under consideration. The atmosphere is rarely saturated with moisture; hence, in passing over the surface of the earth, its almost constant tendency must be to absorb and carry off a portion of its surface moisture, in the form of vapor, in the abstraction of which a certain portion of heat is taken up, in a latent condition; thus, by a single process, dimishing both the temperature and moisture of the soil. The result of this process, it will be observed, is, except within certain limits, an undesirable one; while its rapidity, other things being equal, will depend upon the velocity of the wind; though it may be somewhat retarded, by even a slight cover of verdure, and, still more effectively, by a denser or deeper covering; and, in the most effective manner, by a dense and umbrageous forest. The mere force of the wind, in localities fully exposed to ocean or lake breezes, has, in some cases, proved a serious obstacle to vegetable growth; so much so, in fact, that instances have occurred in which the growth of vegetation has proved nearly or quite impracticable, except by the aid of artificial barricades, to interrupt the force of the wind.

We may be excused if, in the further consideration of the subject, we mainly confine ourselves to the facts (many of them coming within our own observation) connected with the climatology and the present status of the northern United States and adjacent territory.

In portions of what is known as the "Michigan Fruit Belt," the sands thrown up by the waters of Lake Michigan, are by the force of the prevailing westerly winds, piled up in drifts, often around and over tall trees, to the height of 200 or even 300 feet, and extending for miles along the shore, with a dense growth of natural forest under their line. At other points, destitute of these deposits of sand, where the shore is a bluff of clay and the adjacent lands fully exposed to the lake winds, the orchardists, believing the lake breezes to be the chief cause of their local success in fruit culture, and failing to conceive the possibility of having too much of even a good thing, have, in very many cases, cleared away all intervening timber, leaving their plantations fully exposed at all seasons, with the result that they, not unfrequently, suffer seriously during unusually trying winters; while in both spring and autumn, growth is occasionally checked by the injury of the foliage, and by the loosening of the roots from their hold upon the soil, to say nothing of the occasional uprooting of trees, and the blowing down of immature fruit.

Another, and perhaps, for the time being, even a more serious injury consequent upon this practice, and one, moreover, which many are slow to attribute to the real cause, is the apparent failue of the pollenizing process, and even the blasting and dropping of the partially developed fruit, to all appearance, in consequence of the unchecked influence of cold, damp, and often long continued winds, during, or soon after, the season of blooming. The influence of this cause has been especially observable, during the exceptionally cool and backward season, now just past; the foliage of thousands of acres of peach trees, while yet immature and tender, having been almost wholly destroyed by what is known as "curled leaf," where exposed to the unchecked force of cold winds from the lake, generally accompanied by the loss of the fruit; while, in comparatively sheltered locations, injury of a similar character was comparatively slight.

The lessons clearly deducible from the facts just stated, together with the well known peculiarities of this region, are, that the existence of forests upon the eastern shore of Lake Michigan, rather than upon the western, is mainly due to the moisture distributed by the prevailing westerly winds of the warm season; while the more equable temperature, which constitutes its special adaptability to fruit culture, and especially peach culture, is due to the equalizing influence of the open waters of the lake upon the winds of winter; and especially upon the "cold waves," that occasionally swoop down upon them from the north-west. The difference of temperature, during storms of this character, in favor of the eastern shore, is usually about eighteen degrees of the thermometer.

The actual potency of this lacrustine "line of demarcation" is but faintly indicated by its influence upon the mere extremes of temperature. Its ameliorating influence upon a prevalent dry, south-westerly wind, operating through long periods of time, has apparently so far checked the "burning over" process that, while the annual destruction of incipient timber growths, has left to the broad western plains, and the prairies little beyond grass and other vegetation of annual growth; under the lee of these aqueous modifiers, during these same periods, almost the entire surface of the country had come to be densely unforested; until more recently, the merciless axe of a so-called civilization, impelled by a greed for lucre, has, in some cases, supplied the train, by means of which even these forests, so long exempt, have, together with (in many instances) the unthinking hands that have supplied the same, been given over as a holocaust to the terrible enemy.

Within and beneath such a clothing of forest, atmospheric movements proceed but slowly; while both radiation of heat and evaporation of moisture are correspondingly restrained; with the result that the temperature and relative dryness of the partially imprisoned atmosphere, including the temperature of the soil beneath, rarely reach either the maximum or the minimum of the air moving freely above. The amount of this relative retardation, under the shelter of a forest, expressed in degrees of temperature and of moisture respectively, becomes so much increased amelioration to be added to that resulting directly from water protection.

This fact does not, however, as we apprehend, express the whole, nor yet the most important result of forest shelter, when taken in connection with water or other ameliorating influence. The greater rapidity of both evaporation and radiation, in an open region, must necessarily very seriously restrict the operation of any and all equalizing influences, derivable from the presence of a body of water; while, as already shown, the presence of continuous forests must have the effect to perpetuate and indefinitely extend and influence. The extent and potency of this subsidiary influence, we apprehend, is generally but faintly comprehended.

The fact that from Hudson Bay southward, and from Lakes Superior and Michigan eastward, almost the entire region is clothed with dense forests; while, farther west, these are comparatively wanting, can hardly be attributed to other causes than the modifying influence of these, and their accompanying inland seas, upon the prevalent westerly and northerly winds, stimulating and protecting the growth of forests, and with their added influences, extending their spread eastward and southward, till met and reinforced by the operation of similar influences, emanating from the ocean.

Since the necessities and even the convenience of the human race are held to dominate all other interests, we may, very probably, be met with the question—How is civilized man to provide for his needs, except by foregoing the advantages under consideration?

We close with a few hints looking to a possible way out of this dilemma.

A settled and improved agricultural country must necessarily be, as it usually is, subdivided into homesteads or farms, averaging perhaps, not more than from eighty to one hundred and sixty acres each. Upon every such subdivision, at least one-tenth is or should be reserved as a "timber lot."

Had the Government, in parceling out these lands, and in conveying the same to settlers, stipulated that a certain strip or portion, along the westerly and northerly or windward sides of each parcel, and perhaps, in case of larger tracts, strips at intermediate points, should be permanently kept and maintained as forest, allowing timber to be cut thereon only under certain needful restrictions, to insure permanency; the needful reserve of timber, instead of being, as is now generally the case, confined to a square plot, generally at the rear of the farm, would have been distributed as above stated, with the effect to divide the entire region into narrow plots, with wind-breaks so alternated, as to give to the whole nearly, if not quite, the climatic advantages of a region of continuous timber.

The omission of the Government to so provide can not, of course, be now remedied, save, possibly, in the case of lands yet to be sold and conveyed, yet something may, perchance, still be done, as an encouragement to thought and even action in this direction by the enactment of laws exempting from taxation lands thus employed, or possibly by offering premiums for lands so reserved and kept, or even for the planting of wind-breaks under suitable stipulations and restrictions.

Yet another mode of accomplishing the desired result, so far as unsold lands are concerned, apparently still open to the Federal Government, is to amend the timber-planting law, providing that in all future cases such planting shall be done at such points as shall afford the most effectual protection to the lands to be granted in consideration of such planting.

The public thought once prominently attracted to this subject, as is already in a slight degree, the case with the planting of the borders of highways, such thought would readily be drawn to consider the utility of similar shelter about dwellings, ornamental grounds, gardens, orchards, and especially the farm yards and out-buildings, all which must operate more or less effectively in retaining, even for the benefit of arable lands, much of the climatic advantage peculiar to densely wooded regions.

The Black Ash.—We have a much better opinion of this timber than is expressed on pages 99, 100 of this number. Within the last five years, a very large business has grown up in the village of Lowville, N. Y., in the manufacture of Black Ash furniture, and it now employs about seventy men. It runs exclusively upon chamber furniture, (bedsteads, bureaus, washstands, wardrobes, etc.,) and when trimmed with black walnut and varnished, it produces a most pleasing effect. There are other considerable establishments in the Northern States using this lumber quite extensively for furniture, and it is also largely employed for inside finishing. It shows to best advantage when sawn in planes tangent to the rings of annual growth, and when these are cut a little obliquely. Occasionally a place will be found where the growth has rounded over and shut in a broken branch, and the section will present a striking resemblance to the larva of some great insect. This lumber will not bear exposure to the weather, but where sheltered, it is firm, solid, durable, not liable to shrink or warp, and decidedly elegant.

Effect of the weather at the time of Planting.—It is a safe precept never to plant trees on a hot day, and especially if there is a dry and hot wind. If possible, take a day that is cool, and it will be all the better if it is misty or foggy, and when the sun is hid by clouds. Trees set on a damp day are very apt to succeed, while on a dry and very warm day, they will quite as often fail.

Correction of the List of Papers read at the Cincinnati Meeting of the Forestry Congress.—In printing this list, (pages 36–38,) we followed the printed programme, which had accidentally omitted the following titles:

1. " Forest Tree Culture in California, *Prof. Robert E. C. Stearns, Ph.D.*, Berkeley, California; 2. On the Growth of certain California Forest Trees, and the Meteorological Inferences suggested thereby." (*By the same author.*)

This omission we supply, so far as possible by this notice, and in a future number an abstract of these papers will be given.

In the list of members printed on page 35, the name of JACOB H. STUDER, of Columbus, O., was accidentally misprinted.

The Labor that Man will Undertake to get Lumber.—In the leased forests of Busáhir, in India, Silver Fir (*Abies Webbiana*) is sawn into boards 10 feet long and 9x¾ inches. It is carried on men's back a distance of at least thirty miles, more than five of which are over a bad road, with steep ascents and descents. (*Report of Dr. Brandis on Busáir Foreshts, p.* 29.)

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FOREST TREE CULTURE IN CALIFORNIA.*

BY ROBT. E. C. STEARNS, PH.D., OF BERKELEY, CAL.

Review of the Decade 1872–82.

IN the spring of 1872, much enthusiasm was manifested by a considerable portion of the community in California, in favor of some of the Australian trees belonging to a few species of the Eucalypts and Acacias. A small number of copies of Baron Von Mueller's invaluable treatise on "The principal Timber Trees readily eligible for Victorian Industrial Culture, etc.," had fallen into the hands of intelligent persons, and had been noticed by the newspaper press, and other publications of a more permanent character in California and the East, so that, without creating a fever, much interest resulted therefrom. Lest this feeling should prove ephemeral, I thought the opportunity to stimulate the public pulse too good to be lost; so I prepared a paper "On the Economic Value of certain Australian Trees, etc.," which was read before the California Academy of Sciences, July, 1872. This was published in the Proceedings of the Academy, and extensively noticed or copied in whole or in part in various publications at home and elsewhere. In addition to the above, a pamphlet edition of twenty-five hundred copies was printed and judiciously distributed, free of expense to the public.

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* Read at the American Forestry Congress at Cincinnati, in April, 1882.

The result was satisfactory, for there is good reason to believe that it led to the planting of one hundred and fifty thousand trees more than would otherwise have been planted,

The chief importance of the paper, was in its timely publication and wide distribution, and in its not presenting too much at "one meal." As to the matter contained in it, aside from my own limited experience with, and observation on, the Eucalypts and Acacias, and reference to the medicinal virtues of *E. globulus*, its merits belong to Dr. Von Mueller, who was freely quoted and properly credited.

Before this time also, the veteran editor of the *California Farmer*, Colonel Warren, had stirred up the people, and General Stratton, of Alameda county, and a few others, had made their faith visible in their works, by planting several acres. I refer to the above more fully than I otherwise should, in order to impress upon the Association the importance of reaching the public through a judicious expenditure for printing and timely distribution of documents. Ten years have elapsed, and it may be well to look back and review the situation.

It may now be asked, "What is the present sentiment as to these Australian trees? Have they fulfilled expectations, or have they disappointed anticipations and fallen from grace?" Before this question can be properly answered, certain explanations are necessary, and these explanations, and what follows incidentally, may perhaps be the best answer that can be given.

Of the Acacias I am not aware of any plantation that has been made for economic purposes, though many of the species yield products especially useful in the arts. Thousands of trees of a few species have been planted for show, and are still popular for ornamental purposes.

Of the great number of species of Eucalypts (over 150),* probably three-fifths of those planted in California are of the species popularly known as the Blue Gum, *E. globulus;* the other two-fifths being *E. viminalis*, *E. marginata* and *E. rostrata.* Perhaps even a larger proportion of the Blue Gum has been planted than I have estimated, as its more rapid growth gave it the lead of the others in attracting attention, so that in speaking of the Eucalyptus, in California nearly every person would identify the generic name with *E. globulus*, though, as before stated, there are over a hundred and fifty species; only about half a dozen are cultivated in California.

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* Baron Vou Mueller, in a lecture on the Flora of Australia, delivered at Ballaarut, Sept. 13, 1882, gives the approximate number of species of the *Acacia* as 320, and of the *Eucalyptus* as 120. He probably regards some species formerly published as now united with others.—*Editor.*

Aside from its rapid growth, the Blue Gum is undoubtedly of less value for most purposes than its harder-wooded congeners. The number of Eucalyptus trees planted in California during the decade under review is probably over *six millions. One nurseryman*, who makes a specialty of forest trees (almost exclusively three or four of the Eucalypts, the native Monterey Cypress, *Cupressus macrocarpa*, and the Monterey Pine, *P. insignis*), and who contracts to plant any number of trees or acres, claims to have raised and sold nearly the number above stated,* and between two and three millions of the native Monterey Cypress; this latter is, I presume, used only for ornament and hedges, for which purpose it is justly popular. His sales of the Eucalyptus last year were small, only fifty thousand; but this year (1882) he expects to do better, and anticipates orders for seventy-five thousand of the two species, blue and red. As there are many other nurseries in the State which raise and sell the foregoing species, the whole number must be exceedingly great, and quite likely for the *ten years* exceeds the total I have given.

A large portion of said total has been planted in the streets, house-lots, and yards of the cities, towns, and villages, and otherwise used in profusion for the adornment of the larger estates of suburban neighborhoods. So extensively have the Blue Gums and Cypress been planted in many places, to the almost absolute exclusion of deciduous trees, that the vistas afforded by the streets are exceedingly somber and monotonous through general sameness of form and tone of color.

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*I have no reason to doubt his word, but for the sake of an ample margin on the side of fact, I have assumed six millions as a safe total.—*Author.*

As might have been expected under the circumstances, a great deal of inconsiderate planting was done, and the rapacious and irrepressible Eucalypts were, as often as otherwise, placed in a lot where there was only room enough for a flower-bed; often several trees were put in a space represented by the part that is left of a lot fifty by one hundred feet, after the house and outbuildings are provided for. Within such narrow limits the Eucalypts soon become monopolists, and kill out the small shrubs and flowers upon which their shadow falls, or that are within reach of their far-spreading roots. For the reasons just stated, namely, the monotonous effect in streets, etc., through too exclusive use, and the killing out of other and smaller forms through injudicious planting within too narrow limits, these trees are not as universally popular for ornamental purposes in some localities as formerly.

The perfume of the Blue Gum, so agreeable to many persons, and undoubtedly of great value as an anti-malarial, (which is produced by the terp and camphor contained in the foliage), is offensive to many, suggesting as they assert the urine of cats.

As will be seen in the foregoing, there is no argument against the tree *per se*, for the fault is that of inconsiderate and unwise planting, analogous to the planting of potatoes or pumpkins in a flower-bed, or the planting of geraniums and roses in a potato-patch or corn-field. Whatever may be the special beauty or virtues of a plant, it is nevertheless a weed when out of place. So also with our Monterey Cypress—which has, it may with truth be said, a cosmopolitan and world-wide appreciation, wherever it will grow, as one of the most beautiful of evergreen forms—when out of place, or over or unduly planted. In my immediate neighborhood, while many of both the native and foreign species are being planted, many are being cut down. As there was indiscriminate and inconsiderate planting, so there is likely to be indiscriminate and inconsiderate cutting down. The trees removed, however, make but a small numerical showing, as compared with the number still being planted for ornamental purposes. Again, the places formerly occupied by the Eucalypts, Cypresses, etc., are being filled with other species, deciduous trees generally, so that from many points of view there will be a gain.—A gain, not only through the special improvement of given localities, but from the broader aspect of an advance in popular knowlege and popular taste and increased public interest in tree-planting, and incidentally in forest culture.

The present set of the current, though local and limited, was anticipated by me in my paper (of 1872), where I remarked:

> "We have many native trees well adapted for timber or wind-breaks and while calling the attention of land-owners and others to the exotic forms above mentioned and their special qualities as enumerated in Dr. Von Mueller's excellent paper, I do not wish to be understood as making an unfavorable comparison as against indigenous species, as for some of the purposes mentioned they will answer equally well."

To have pressed the point sharply at the time might have deterred many from planting at all. And here I may be allowed to diverge for a moment from the general path I am pursuing to say, that if evergreen trees are desirable or to be planted, no foreign forms can be found that for beauty or utility surpass in luxuriant and graceful beauty our Lawson's Cypress (*Cupressus Lawsoniana*) and the Hemlock Spruce (*Tsuga Douglassii*); yet these matchless forms are so rarely seen in our streets and yards as to make the occurrence of a specimen noticeable to him who loves trees and knows the sylvan treasures of our native forests.

Where space will admit, these beautiful forms are especially suitable for wind-breaks and high *untrimmed* hedge-rows; so also with the Monterey Cypress and Pine, the sturdy lateral branches of the latter making it particularly useful where high winds have to be resisted.

So far as the main question affects the ornamental culture of Australian trees, etc., in California, the foregoing rather diffuse explanation, must be the answer.

In the matter of Eucalyptus and forest culture within the decade, much has been learned, as to the relation between climatology and these trees, and the proper selection of species to meet the climatic limitations. It should be borne in mind by those living east of the Rocky Mountains and the great American desert, that but little is known of the meteorology of the occidental half of North America. The oldest inhabitant, the California aborigine, not a very high type of the American red man, had but little thought of the subject from the economic side; or if he had, the records were simply kept upon the inexact tablets of his memory, and handed down traditionally from generation to generation. The Spanish padres, who in a certain way may be regared as the successors of the Indians, or the connecting link between the present civilization and the barbarism of the past, did better; but in a very general way,—limited by their limited agricultural experiments,—transmitted some light upon the peculiarities of the climate of California. Practically but little was known by the Americans at the time that agriculture became a pursuit or vocation on this part of this Pacific coast, so that our present knowledge has been purchased by experience and frequently at a great loss of money, energy and time. This loss of time and money has ensued in some places to those who planted the *Eucalyptus globulus.* This species, which seems generally to thrive within the influence of the coast climate, where the saline quality of the coast atmosphere neutralizes the occasionally too low temperature of the winter months, often fails in the interior. 28° Fahrenheit is about the temperature limit as to cold. It would be extraordinary indeed if this species, or any other one species of the forest tree, planted as extensively and over so wide and diversified a climatic area as *E. globulus* has been, from Oregon throughout California, into Arizona, did not fail somewhere within so vast a territory. Bearing upon this point as well as showing how many have been planted, etc., the following, kindly furnished me by J. R. Scupham, Esq., of the Central Pacific Railroad Company, is of particular interest:

"The Company have planted *Eucalyptus globulus*, *E. rostrata*, *E. sideroxylon*, *E. cornuta*, *E. marginata*, and other varieties. Some were bought in the nurseries, but most of them were raised from seed sent by Von Mueller. Hundreds and thousands of trees have been planted along the right of way and in plantations. About San Francisco Bay *all* species flourish if cultivated when young; but most growth is made by the *E. globulus*, *E. cornuta* and *E. gigantea*. In the interior valleys these species will not flourish, are not sure even to live save in exceptional places; while the *E. rostrata* and *E. viminalis* seem to do well and bear the frost. At Delano is one interior locality where the *E. globulus* flourishes in spite of frost. A rich soil compensates for some frost, as is evinced also by this species also flourishing at Chico. The first group mentioned will not grow in Arizona, nor along the Southern Pacific Railroad east of Colton. In a plantation of one hundred and twenty thousand trees at Tipton, well cared for, nearly all the trees of the first group died after struggling along for two years, while the *E. rostrata* and the like thrive though growing slowly."

"It is never too late to mend," and though the too exclusive planting of *E. globulus* has resulted in occasional disappointment, such instances, though often chargeable to lack of judgment in the party disappointed, (nevertheless to be regretted,) are not numerous; and it is gratifying to perceive that no material check has been given to tree-planting by these occasional mishaps. The Eucalypts now being set out are selected with proper regard to local climate, soil and station, as well as to the quality of their wood. For regions where the summer heats, drouth and winter frosts are factors, the species named by Mr. Scupham are now being used.

Touching the value of the Eucalypts for lumber, based upon the product of California-grown trees, but little can be said. The time has not arrived to determine that question. The lumber sawed in Australian mills is not made from trees of only ten to fifteeen years of age, and it is probable that very few of the Eucalypts planted in California are as old as fifteen years from the seed. Our native trees of so recent a growth are not used for or made into lumber, and nothing but soft and sappy wood can be expected from trees so young. The reported unsatisfactory results of experiments with telegraph poles and railroad ties, so far as regards the latter use especially, might have been anticipated, though the experiment with the Red Gum, if the wood was properly seasoned, was worth the trial. Whether the telegraph poles were barked and well seasoned before setting I have not learned. For the purposes of fuel the wood of these trees requires to be split immediately after felling, the same as the White Birch of the East, otherwise it becomes soggy and worthless.

Of the profit of Eucalyptus-growing for fuel purposes, the most reliable testimony is that which relates to the plantation of Gen. Stratton, before referred to, which consisted of forty-five acres, (forty-three of *E. globulus* and two *E. viminalis*,) planted in 1869—ten being from seed sown April 7, 1869. Recently, twenty acres of this artificial forest have been cleared, to make room for an orchard, and after charging every item of cost and a yearly rental of five dollars per acre, the net profits, as shown by the owner, are "$3,866.04 on twenty acres in eleven years."

Prof. Hilgard, of the University of California, recently distributed circulars for the purpose of collecting facts regarding the Eucalyptus from the various forest-growers throughout the State. Though but few responded, the information obtained is of great interest, and the bulk of testimony decidedly favorable. Time and space will not permit me to extend this communication by giving the details as presented by Prof. Hilgard, at a meeting of the State Horticultural Soc. Of his remarks thereon I quote as follows from the *Rural Press* of Feb. 4th, 1882, and also inclose a copy for further reference if required:

> "Of the Eucalyptus, Prof. Hilgard said that it was no doubt a great pest when it was planted in the wrong place; but there is abundant use and space somewhere for a rapidly-growing, drouth-resisting tree, which grows well in half the State. Part of our State, because of its lack of trees, is called an arid region. If all the lands capable of bearing the Eucalyptus were forest, who would call it so? Not only the name, but the climate would change.
>
> "We need fuel, lumber, railroad ties, etc. If the Blue-Gum does not make good ties, other kinds of Eucalyptus will. The wood is no softer or more porous than Redwood; probably as durable and resistant of insects or decay. It is better fuel than Cottonwood, and it is good for inner cabinet-work if not for outside.
>
> "Beggars should not be choosers. If we are in a Californian hurry to get rich in tree-growing, we can not grow first-class woods. We are trying all sorts of trees. At the University they are now being set out. It is desirable that hard-wood trees should be planted for future use. But let us not despise the *Eucalyptus globulus* for immediate use. Let us clothe the Coast Range and foot-hills with forests, if only to increase the rain-fall and the beauty of the country.
>
> "Suppose even that the estimated returns from planting given us are too high to the average; still, if we can get full farm rent off of millions of acres now lying out, it will add greatly to the wealth and promote the industries of the State. We can not grow hard-wood forests in time for the giving out of the Redwood supply. Let us have something to fall back upon."

In relation to the sanitary and medicinal value of certain species of Eucalypts, though perhaps too much has been claimed by enthusiastic friends, there is enough, minus exaggeration, to justify their being regarded as of unquestionable merit. My own opinion of the medicinal virtues of the *E. globulus* in certain cases, based upon personal experience as heretofore expressed, has since been confirmed by repeated experiments.

From the foregoing it will be seen, and I believe readily conceded, that tree-planting in California for the past decade, *has not been a failure;* that if one-half the trees planted as represented by the preceding figures, are still living and growing, *the past has been really a very great success;* that if new plantations are being made at the rate of say, only fifty thousand to seventy-five thousand per annum, that the present is full of promise and the future full of hope; that the very disappointments which have occurred, though a loss to individuals, are a public gain, as being likely to eventuate in a more diversified and intelligent selection, and to induce a more extended and critical inquiry as to the economic and æsthetic value of other sylvan forms.*

PLANTING IN WASTE PLACES.

By BERNHARD E. FERNOW, of Slatington, Pa.

MOST of the methods recommended and described in American papers for planting forests, presuppose that the ground to be planted is arable, or at least workable with the spade. This may be all right for the Prairie States; yet there are probably on every farm in the mountainous regions more waste places than anywhere else, that will never pay to get the stones out—that won't grow any grass of value, and that defy all cultivation. There are others which are too wet, and on account of their nature drainage for agricultural use is impossible or unprofitable; others again, which on their dry, shifting sand will not bear any crop.

These are the very places to which, in time, the forest in every well-settled country will be more or less confined, the better portions being needed for farming purposes; and fortunately enough, not only can such places be made to bear

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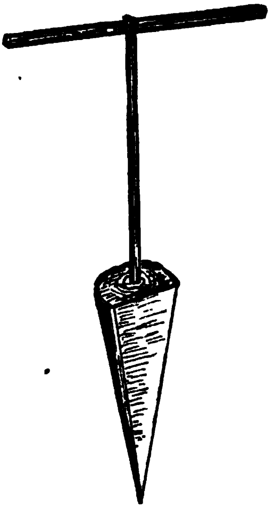
*This paper was accompanied by a collection of herbarium specimens of several species of Eucalypts grown in California. These were possessed of great interest.—*Editor.*

forests, but, being so used, they are improved, and often, after some time, gain in value, even for agricultural crops.

To find out cheap methods for covering such places with a tree-growth is therefore a task not to be neglected.

With this object in view, I give the following description of a very valuable instrument, to be used in places where the spade is not easily applied, or where it is an object to quickly cover a large area. It is especially applicable for one and two-year-old-plants (in most cases the best age for planting), and is most extensively used in Germany, for the inforestation of the large heaths, in the sandy plains, and in mountain lands. Millions of young pines are planted every year in this way.



This instrument consists of two parts: a shoe made of iron, with one rounded and one flat side, tapering towards the end, in shape like a half cone, so that two of these shoes placed together, with the flat sides, would represent a perfect cone, or nearly so; in the center (somewhat nearer the flat side) of the base is a threaded hole to receive the handle, which consists of an five-eighths inch rod, three and one-half feet long, with a squarely set wood haft. The shoe may be made eight inches long and three and one-half inch at the base, and to make it somewhat lighter it may be cast with a square oblong hole half way through the back.

The *modus operandi* is to thrust this iron dibble into the ground where the plant is to stand, somewhat open up the hole thus made, by moving the dibble back and forth; withdraw, put the plant into the hole to the straight side, thrust the dibble again into the ground one to one and a half inch back of the first hole, somewhat slantingly towards the bottom of this, press forward to fasten the plant in its stand; then by a few irregular thrusts close the last made hole and proceed to the next place.

The original instrument had a short, rounded handle, and the whole operation was done by one man, who could dispose of 1,200 to 1,700 plants, according to locality.

Where the planting is done on a large scale, the work progresses most expeditiously, if an active boy, or still better, as my experience goes, a woman, serve two planters with the plants. The planters manipulate the dibble, whilst the boy with the plants, in a mixture of loam and water (to keep the roots not only moist, but also heavy for better dropping into the plant hole), holds the plant in the hole, first serving the one and then the other. With this force, if accustomed to the work, 5,000 plants may be disposed of per day, or as for such planting of yearlings, at least 7,000 plants should be set out per acre. The planting will cost from $4.50 to $5.50 per acre.

THE PECAN (CARYA OLIVÆFORMIS).

BY S. B. BUCKLEY, OF AUSTIN, TEXAS.

THIS tree grows north as far as latitude 42° along the tributaries of the Mississippi River. At Terre Haute, on the Wabash, Indiana, according to Prof. Wood, there are specimens of it 80 to 90 feet high; hence it attains fully as large dimensions as regards height at the North, as it does in the South-Western States, where it most abounds.*

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* Prof. Robert Ridgeway of the Smithsonian Institution, in a catalogue of the native trees of the Lower Wabash and White River Valleys, in Illinois and Indiana, (June, 1882) remarks as follows concerning this species:

"Common in rich bottom-lands. This is by far the largest of the Hickories, being in truth one of the very largest trees of the forest. With the single exception of the White Elm, the Pecan tree has, in proportion to its size, the most widely expanded head of any tree, while in altitude and majestic appearance, the largest and finest Elms bear no comparison. The dome-like head may occasionally be seen reared conspicuously above the surrounding tree-tops, even in a very lofty forest—some trees being as much as 175 feet high (by actual measurement) with an ambitus of 100 feet or more. The trunk, like that of the Shell-bark Hickories (*Carya alba* and *C. sulcata*), is very long, often measuring more than 50 feet, and occasionally 80 to 90 feet to the first limbs. A very large tree of this species, cut down in the "Timber Settlement," Wabash county, and measured by Dr. Schneck, was found to be 175 feet high, with a clear trunk 90 feet long, and 16 feet circumference. Another, still standing, only 15 yards distant, had exactly the same circumference, and apparently agreed very closely in other measurements. A very fine tree in the

It grows throughout a large portion of Texas, particularly on rich lands along streams. Last spring the writer saw it growing at Lampasas Springs in Mexico, 75 miles S. W. of lands on the Rio Grande. On the Lower Brazos River in Texas, one was measured in 1860, which was six feet in diameter at three feet from the ground, with an estimated height of 80 to 90 feet. It was a majestic tree, with large spreading branches. I now have a Pecan tree near my barn, which has a circumference of eight feet four inches, at four feet from the ground. Its lower branches are large and nearly horizontal and about 15 feet from the ground. Its spread of branches is about 48 feet, in one direction, and 50 in another. In summer, it gives a very useful shade. This fall we have gathered five and a half bushels of pecans from it, and there appears to be a bushel yet to gather. I sold four bushels in Austin, for $14.00, and there are more than enough remaining for family use. This is an uncommon yield. The pecans were in clusters of from four to six, and so thick and heavy that some of the branches were broken.

Many bushels of pecans are bought at Austin, and sent to other markets, both north and south, where they are rapidly growing into favor, being considered by many the best nut grown. About twenty-three years ago, I measured some Pecan trees near the Santee River, in South Carolina, one of which was six feet and ten inches in circumference, at three feet from the ground. They were planted by the Huguenots from seeds obtained in Louisiana.

The Pecan has tap-roots, which are often branched at the depth of two or three feet, and growing then still deeper. Hence, it is difficult to transplant it successfully, when it is more than one or two years old. It is also very difficult to eradicate, when it is deeply rooted. This I know from experience, having some sprouts of it growing, which I have vainly tried to kill, by repeatedly digging out the roots to a depth of

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White River Bottoms of Gibson county, Ind., was 30 feet in circumference at the ground, and 18½ feet above the swollen base. The column-like trunk was more than 50 feet to the first limb, while the lofty top spread 100 feet. Near Sandborn, in Knox county, Ind., according to Prof. Collet (*Cox's Geological Survey of Indiana*, 1873, p. 364), there is a tree of this species measuring 8 feet in diameter, but its height is not stated."

from six inches to a foot. Hence, the Pecan is little affected by the drouths of summer. Its wood makes an excellent fuel, being considered one of the best. It is much used for ax helves and other purposes, where toughness is required, but large sticks of it are not durable, when unprotected from the attack of insects, by which they become worm-eaten and soon decay.

In Texas Pecan trees begin to bear at from six to twelve years old, according to favorable or unfavorable conditions. I had some sprouts from stumps, that grew into trees, and began to bear when six years old; but these were fed by the roots of trees in a deep rich alluvial soil, which had been cut when about twelve inches in diameter. I think the Pecan would thrive on the deep rich prairie soils of the west; and if so, it would surely be one of the most profitable trees to plant.

[Our correspondent makes no allusion to the barbarism often practiced in gathering pecan nuts. We are not aware how generally this prevails, but the following item from the *Vincennes Sun* (Nov., 1882) will illustrate the point:

> "We understand that about twenty Pecan trees have been cut down by nut-hunters near the mouth of the Embarras River. The owners of the land were so incensed at the vandalism, that they prowled the woods a day or two with shot-guns, in order to teach the interlopers a lesson."

There should be an efficient law for punishing, and an energetic means for prosecuting such wanton waste.]

THE MICHIGAN LAW FOR TREE-PLANTING BY THE ROADSIDES.

THE Consolidated Road Act of Michigan, approved June 8, 1881, presents one feature in respect to planting by the roadside that deserves attention; and as the season has come around at which the Legislatures of most of the States are in session, we present below, so much of the law as relates to this subject. It will be seen that it is obligatory upon Townships, unless by a vote at a Town Meeting, the citizens excuse themselves from its operation, and that unless so determined, the work must continue from year to year, until all the roads are planted.

We regard this law as eminently progressive, and especially worthy of imitation in the Prairie States:

"CHAPTER X. *Shade-Trees and Watering Troughs in Highways.*

"SECTION 1. Shade-trees shall be planted along both sides of the public highways, at the uniform distance, as near as may be, of sixty feet apart, and not less than twenty-three nor more than twenty-five feet from the center line of the highway, but the Township Board of any Township may direct as to the distance which trees may be set from each other or from the outer line of the highway. All trees now growing upon the sides of any highway, and all trees that may be hereafter planted thereon, standing more than sixty feet apart, shall be preserved, and shall not be injured or removed, unless by direction of the Commissioner of Highways, and with the consent of the owner of the adjoining land, unless such trees shall interfere with or obstruct the travel on the highway: *Provided*, That the provisions of this Chapter in whole or in part shall not be deemed mandatory in townships in which the electors may by vote at a Township Meeting thus determine.

"SEC. 2. Any person planting shade-trees along the highway adjacent to property owned or occupied by such person, shall be entitled to be credited twenty-five cents upon his highway-tax for every tree so planted, but not to exceed in the aggregate twenty-five per cent of such person's highway-tax in any one year.

"SEC. 3. In road-districts where there are not trees planted and growing along the highways to the extent required by the first section of this chapter, the Commissioner shall require that at least fifty trees per year be so planted in each district, and shall require the same from year to year, until every highway in his Township where the adjoining lands are cleared, is supplied with shade-trees, as contemplated by said first section, but not more than twenty-five per cent of the highway-tax shall be appropriated for such purpose in any one district in any one year. The overseer, acting under the direction of the Commissioner, may require twenty-five per cent of the highway-tax of any person in any year, to be paid in money, the same to be applied in planting shade-trees along the highway adjoining the property of such person. The overseer shall particularly attend to the planting of such trees, and shall allow no unsuitable tree, nor any tree wanting sufficient roots or vitality to be planted, and he shall have the charge of and care for the same in the best manner for their growth.

"SEC. 4. Any Commissioner may cause to be constructed suitable watering-troughs, basins, or fountains by the roadside for the refreshment of persons and animals passing upon the highway, not to exceed one, on some one of the more important roads in each road-district, and may contract therefor with some suitable person in each such district, and may credit on the highway-tax of such person a sum not exceeding ten dollars in full consideration for the erection of such watering-troughs, basin, or fountain, and supplying the same with water for the first year, and five dollars annually thereafter for keeping in repair and supplying the same with water."

REMINISCENCES OF FOREIGN TRAVEL.—(No. 3.)

By the Editor of the American Journal of Forestry.

SUNDAY, *August* 7, 1881. Arrived at Stockholm at 9 A. M. by railway from Christiania, and after getting located at the Grand Hotel, which fronts across the harbor from the Royal Palace, the day was chiefly spent in looking through the parks, and visiting the National Museum. It is pleasing to notice the honors conferred upon men of science in every country, where their influence is felt. At Copenhagen, a conspicuous place is given to the Statue of Oërsted, with the implements of his electrical research by his side; and here in Stockholm, Berzelius, the great Swedish chemist, stands in bronze, the central figure in a fashionable park that bears his name.

In the afternoon, great numbers of peasants with picturesque costumes, begin to flock into the city, and from the crowds gathering upon a large number of steamers great and small, that lay along the dock, with banners and music, it was evident that some spectacle was at hand. We joined the crowd, which was going out to Waxholm, some twelve miles away, to welcome the returning fleet of yachts, that had been racing in the open sea. The return was an occasion for a grand display of fire-works, on board these vessels and along the shores and islands,—a spectacle which lingered till a late hour in the night, and finally landed us long after midnight, a mile and a half from the hotel, and on the wrong side of the harbor. This regatta is held once a year, and we fell into it by accident. There must have been 20,000 spectators on board the fleet of steamers, which were at least fifty in number.

Aug. 8. Having called at the American Legation, and learned from our Minister-Resident, Mr. Stevens, that the Director of Forests, (Mr. C. A. T. Björkmann), was absent, but that his deputy, (Mr. E. G. Sundberg), was in town, we called at the "*Skogs-Styrelsens,*" (Forest-Administration), and made known the object of the visit. Mr. S. received us with the greatest civility, and afforded full information in the way of recent documents, blank forms, maps, and explanatory statements, concerning the forest resources of the country, and their methods of management. The government has a Forest Academy adjacent to the city, near a public park, known as the "*Djurgard,*" (*Deer-Garden*), a place of great popular resort. It is on the main shore, but close by a large island, with many pleasant villas and beautiful walks. It is very easily accessible by steam ferries and tramway, and upon the grounds in the park are various statues and points of historical interest. The grounds of the "Skogsinstitutet," (*Forest Academy*), were closed for vacation, but the information already obtained from Mr. S. supplied the data for every thing relating to its organization, and the course of instruction. There are besides this, seven elementary Forest-Schools in Sweden, for the preparation of agents of lower grade. They are of an eminently practical kind, and a part of the time of the students is given to actual labors in the forest.

In former times, there were restrictive measures, with regard to private forests, which in time were removed, but now, there is a tendency in Sweden, to a return to a policy, which although it interferes with the enjoyment of personal rights, appears to be dictated by necessity. In the district of Norrland, there has recently been established a restriction upon the size of trees that may be cut, the details of which we can not here give. They will be presented in our official report.

The forests of Sweden are chiefly fir, (*Picea excelsa*), and Pine, (*Pinus sylvestris*), with Birch, Alder, and Poplar. Some Oak is found south of the Dalelf, and Beech, in the extreme south, opposite to Denmark. Besides these, there are some little plantations of White Mulberry, and other exotic trees. The total area of Sweden not covered with water, is 40,672,000 hectares,* of which 4,693,000 are fields, and meadows. Of the balance, about 40 p. c. of "terra firma" are forests, and of these two-thirds lie north of the Dalelf.

At the close of 1876, the woodlands in state parks amounted to 1,843,600 hectares;—state plantations on shifting sands, 2,200;—state woodlands not marked out 1,344,300;—woods on state domains and manses farmed on state account, 49,100;—ceded to officials, ecclesiastical and other, 530,900;—

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* The hectare equals 2.47 acres.

owned by public institutions, 35.60; granted to saw-mills, 244,100;—granted for metalurgical uses, 28.00;—owned by communes, 172,200; and owned by state manses, and in clearing concessions, 971,500, making a total of 5,221,500 hectares, (12,897,105 acres), under state control. The private forests of the country amounted to 30,757,000 *h.*, (75,972,260 *a.*), or about 85 p. c. of the whole.

A serious strike among laborers in 1879 in the Sunswald District, made it necessary to employ troops to prevent excesses. From this and other causes, the timber-trade was disturbed, and of 890,000 dozen logs, but 500,000 doz. were got down to the Gulf of Bothnia in 1880.

After finishing all that could be done at Stockholm, and engaging a passage to Finland, there still remained a day before the steamer sailed, which gave an opportunity for visiting the ancient University at Upsala, some forty miles north of Stockholm. The railway passes through a fertile and level country, and the train arrived at an hour which by the watch appeared late. It was however still before sunset, and after finding comfortable quarters at the *Hotel Svea*, near the station and its well kept grounds, there was still time for seeing much of the town. The half-day twilight of this northern region had not faded into the gloom of the short summer night, before we had alone, and without map or guide, obtained a view of the principal streets, and the park with its stones bearing Runic inscriptions of ancient date. They witness the last vestiges of a heathen religion that long lingered in this region, and appear in striking contrast with the advance that is now seen on every hand.

The city lies on both banks of the Fyrisa; has 13,000 inhabitants, and may be regarded as the historical and intellectual center of Sweden in the olden time. The chief attraction is its University, (founded in 1477), and its appendages, the Botanical Garden, and the Observatory. The premises and buildings are extensive, but somewhat scattered, and the only one of them that we could visit the next morning was the Botanical Garden, under the charge of Prof. Theodor Magnus Fries. We were most courteously received, and conducted through the grounds. He could speak but a few words of

English, and at that time we had not had much practice in French; but it was wonderful to see how readily we got along in language, with the help of now and then a word of Latin. The Professor pointed out many objects of interest in the town, and especially in the grand old Cathedral, some five or six hundred years old. It is the burial place of King Erik IX., (d. 1160), the patron saint of Sweden, and of Gustavus Vasa and other illustrious dead; but among the rich sculptures that tell their story of departed greatness, in times long ago, there was nothing that afforded more interest, than the tomb of *Linnaeus*. There is a large plain tablet in the floor and over his remains on a pyramid of porphyry in one of the aisles, is a bronze medallion bearing the inscription, "*Carolo a Linnè Botanicorum Principi Amici et Dèscipuli*, 1798." There is a marble statue of the great naturalist at the Botanical Garden, and memorials are on every hand, including the house where he lived, and the one where he died. Professor F. informed us that no part of the herbarium of Linnaeus is now in their collections.

The number of students in the University is about 1,500. They are divided among thirteen "nations," each like the colleges at Oxford and Cambridge, having its own buildings, with its curators, inspectors and committee of arrangements.

Returning to Stockholm, we took passage in the afternoon of the 9th of August for Hango, in Finland, near which place my Scottish friend of Haddington, thought I would find *Evois*, the next point of interest. It is the seat of a school of Forestry, under the direction of Mr. *A. Blomquist.* We had corresponded much with this gentleman for several years; he was expecting our arrival, and many pleasant anticipations were borrowed from the near future, which were soon more than realized.

As we were going on board the *Aura*, a young man belonging to the Forest Administration, who had been an eager listener the day before, came to place in our hands, a personal souvenir from himself, of several recent publications upon Forestry, and to ask some questions about the Forestry of the Future in America. Perhaps among the many thousands of Scandinavians who have found a home among us, there were some who were bound to him by ties of kindred—perhaps by something stronger. At any rate, he was eagerly in quest of information about our woodlands, their extent, and their future prospects,—and we doubt not he could easily be persuaded to learn more about them by personal observations. We found a pleasant company of American travelers on board;—one had just returned from the North Cape, after visiting Iceland; another with his wife in company, was buying books for a University, and was on his way to the great fair at Novgorod in Russia, and another, was engaged in a manufacturing business at St. Petersburgh, and sadly in arrears, as to recent events in America. In such company. all willing to inform, and eager to learn, the time flies quickly, and the opportunity is well improved.

THE CONIFERÆ OF THE UNITED STATES AND CANADA.

By DR. GEO. VASEY, Botanist to the Department of Agriculture, Washington, D. C.

(Continued from page 136.)

THE Red Pine (*P. resinosa*) has nearly the same northern limit as the White Pine, but does not extend as far eastward, nor probably as far to the south. It is not so abundant as the White Pine, seldom forming very extensive forests, but usually found in small groves. In abundance and commercial importance in the north it ranks next to the White Pine.

The Pitch Pine (*P. rigida*) is found in Northern Maine, Vermont and New York, thence more abundantly southward east of the Alleghenies to Georgia. It does not appear to be found in Canada, nor to the west of the Allegheny Mountains. In the north it occurs sparingly with the Red Pine, and indeed is confounded with it by many people. As a lumber it is coarse and inferior.

Bank's Pine or Scrub Pine (*P. Banksiana*), is essentially a northern tree, having its greatest development in Canada. Dr. Bell states that it occurs throughout Nova Scotia and New Brunswick, running northward to Lake Mistassini, thence west to the Moose River, 100 miles south of James' Bay. From thence Mr. Bell says it extends northwesterly to the Mackenzie River quite to the Arctic Circle.* "It is common on the north shore of Lake Huron and around both shores of Lake Superior. Although a small and scrubby tree in the southern and eastern parts of it range, in the central part it attains much greater perfection." "On the southern branches of the Albany," says Mr. Bell, "I have seen large groves of these trees about seventy feet in height, and two feet in diameter at the butt, with straight trunks nearly free from branches for the first twenty or thirty feet." Within the United States it is a rare tree, confined to the vicinity of the Lakes, and the northern parts of New York and New England.

Jersey Pine (*Pinus inops*). South of New York we meet with the Jersey Pine, a small tree sometimes reaching 40 feet high, commonly much lower and fruiting freely when 8 or 10 feet high. The leaves are usually 1½ to 2 inches long, in fascicles of two, of a bright lively green color. The cones are small and armed with short stout prickles. The wood is inferior and of little value except for fuel. It is found in all the Atlantic States south of New York to Florida, also in Alabama and westward to Arkansas, as well as sparingly in Kentucky. In Florida a variety of this species occurs (var. *clausa*), which has narrow leaves and larger cones, and the cones frequently remain closed on the tree for several years.

The Short-leaved Pine, or Spruce Pine (*Pinus mitis*), has nearly the same range northwards as the *P. inops*, occurring in the Atlantic States south of New York; also in Missouri, and in Arkansas forming extensive forests. It attains the height of from 40 to 70 feet, and sometimes a diameter of two feet. The leaves are short, mostly in twos, and the cones small and furnished when young with slender prickles, which disappear with age. The wood is yellowish, hard and durable.

Table Mountain Pine (*Pinus pungens*). This species occurs in the Allegheny Mountains, from Pennsylvania to North Carolina. It prefers high rocky ridges or precipitous mountain sides. The leaves are mostly in twos, rigid, and 3 to 4 inches long. The cones are 3 to 4 inches long, very dense and heavy, and furnished with stiff, persistent prickles. The cones are said sometimes to persist on the tree for 20 years or more. It seems to be very sparsely distributed, nowhere occurring in large quantity. It is a tree of vigorous and rapid growth. It was first found on the Table Mountain of North Carolina.

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* Prof. Dall states that he has not seen any Pines as far north as McKenzie's River, but that the *Abies balsamea* (sometimes locally called "Pine,") is found there.

Spruce Pine (*Pinus glabra*). This species grows from South Carolina to Florida, and in the Gulf State east of the Mississippi. It is a tree of 40 to 60 feet in height, with smoothish bark and soft white wood. The leaves are in twos, the cones small and with weak deciduous prickles. It does not appear to be of much economic value.

Pond Pine (*Pinus serotina*). This is closely related to *P. rigida*, and by some botanists is considered a variety of it. It occurs in North and South Carolina, Florida, Georgia, and Alabama near the coast, in low swampy soil. In Alabama, Dr. Mohr says it is a large tree, and he thinks is a distinct species. The leaves are in threes, and five or six inches long. The cones are from 2 to 3 inches long, ovate, and armed with fine short spines which disappear with age.

Loblolly Pine (*Pinus taeda*). A tree growing 50 to 100 feet high, and 2 to 3 feet in diameter. It is found from Virginia southward to Florida and westward to Texas; in South-eastern Texas it forms extensive forests. It rapidly takes possession of lands that have been exhausted by cultivation. The leaves are mostly in threes, slender and about six inches long. The cones are about 4 inches in length armed with strong spines. It is a tree of rapid growth. The wood is of inferior value; it decades rapidly where exposed to the air.

Pinus Elliottii. These species ranges from South Carolina to Florida and the Gulf States, near the coast. It is a large tree, 50 to 100 feet high, and is considered one of the handsomest of the Southern Pines. It is similar to, and perhaps identical with, the *P. Cubensis*, a species prevaling in the West Indies.* It has reddish-brown bark, the leaves in twos and threes, mostly about 9 inches long. The cones are peduncled and recurved, oval to conical, usually 4 or 5 inches long, of a rich brown color, the scales armed with short, sharp prickles.

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*This identity is we believe now admitted, and the specific name "*Cubensis*," will have preference.

Long-leaved Pine, Yellow Pine (*Pinus australis*). This is the most important and valuable of the Southern Pines. Extensive forests of this species are found in North and South Carolina, Florida, and the Gulf States. It furnishes the turpentine, tar and resin of commerce. The wood is strong, compact and very durable, and is extensively used in ship building, as well as for building and fencing purposes. It is a lofty tree attaining a height of 75 to 100 feet, but is of slow growth. It fruits sparingly, some years no cones being matured, and does not readily renew itself on ground once denuded of it.

We now pass westward into the Rocky Mountain region in Colorado, New Mexico, Utah, Wyoming, Montana, and Dakota. Here we find about 5 species, viz: *Pinus ponderosa* (var. *scopulorum*), *P. Balfouriana* (var. *aristata*), *P. flexilis, P. contorta* (var. *Murrayana*), and *P. edulis.*

The last named is a small tree growing at moderate elevation, and well known by its Spanish name of Piñon or "Nut Pine." It is abundant in New Mexico, less frequent in Colorado and northward, probably not passing much above the 40th parallel. Its nuts furnish a favorite food for the Indians.

The *P. ponderosa, P. flexilis, and P. contorta* are the principal ones north of the 40th parallel. The *P. ponderosa* is the largest and most valuable. The wood is hard, heavy and durable. The *P. flexilis* is common at high altitudes, growing from 30 to 60 feet high, with soft, white wood, and is said to be a valuable timber tree when of sufficient size. The *P. contorta* ranges from Utah and Colorado northward to Oregon. It is a tree of 50 or 60 feet in height, with light, straight-grained and valuable wood.

Some of these species extend westward into the Sierras of Nevada and California. The *P. ponderosa* here becomes larger and more valuable, in some cases attaining a height of 300 feet, and a diameter of 15 feet. The *P. Jeffreyi* prevails on the summits and eastern slopes above 5,000 feet, ranging into Oregon. It has very large cones, from 6 to 10 inches long, and 4 inches diameter. It grows frequently to the height of 150 or 200 feet, with a diameter of 6 to 10 feet.

On the eastern slopes of the Sierras in Southern Nevada and extending into Utah, we find *P. monophylla*, remarkable for having the leaves single or rarely two in a sheath. It is one of the Piñons, and its nuts are nutritious, with a soft, thin shell. It is a small tree of 20 to 40 feet high, its wood being chiefly valuable for fuel.

On both sides of the Sierras, at elevations of from 4,000 to 7,000 feet, we find the famous Sugar Pine (*P. Lambertiana*), so-called from the sweet resinous juice which exudes from partially burned trees. It attains gigantic dimensions, from 150 to 300 feet in height, and 10 to 20 feet in thickness, and reaches an age of 550 or 600 years. It has the largest but not the heaviest cones of any of our species, they reaching a length of 16 to 18 inches, with a thickness of four inches. The timber is highly prized for building purposes, and the tree is fast becoming exterminated. The leaves like those of the White Pine are in fives.

Growing at higher elevation, and extending also northward into Oregon, we find the Little Sugar Pine (*P. monticola*), a tree of moderate size with white soft wood resembling that of the eastern White Pine. Being at high altitudes it is less accessible than the Sugar Pine, and consequently has not been so extensively destroyed.

Passing down the western slope of the Sierras to the foothills, we meet with two remarkable Pines, viz: *P. Sabiniana* and *P. Coulteri.* The former is called "Digger Pine" or "Hard Nut Pine." The leaves are in threes, 8 to 12 inches long, slender and drooping. The cones are massive, oval in form, 6 to 10 inches long, by 4 to 6 inches thick, and weighing 4 to 6 pounds. The nuts are large and nutritious, and are much sought for as food by the Indians. The tree attains a height of 50 to 100 feet, with a diameter of 1 to 2 feet.

The *Pinus Coulteri* is a tree of similar size, with very thick, rough, blackish bark. The leaves are also in threes, 6 to 10 inches long, stiff, erect, and crowded at the ends of the branches. The cones are similar to those of *P. Sabiniana*, perhaps excelling them in weight, but the seeds are smaller. They both prevail also in the Coast Ranges, where we get the addition of two small species, *P. tuberculata* and *P. muricata.* The former is a small tree or bush, 5 to 20 or rarely 40 feet in height, extending nearly through the State.

The *Pinus muricata* is a small tree, 30 to 40 feet high (rarely 80 to 120 feet high, according to Sargent), growing "only near the coast, where it is exposed to the sea, winds, and fogs, up to an altitude of 2,000 feet, from Mendocino, where it grows tallest (in peat bogs), to Monterey and San Luis Obispo." (*Eng. in Bot. Cal.*)

Passing northward near the ocean we find the original *P. contorta*, a small tree, usually 15 to 20 feet high, growing on the wet sandy coast from Mendocino county to Alaska. The cones frequently remain closed for years, and are so numerous that they almost hide the foliage. The tree resembles the Jersey Pine of the Atlantic Coast.

On the coast in the vicinity of Monterey and occupying a very restricted area occurs *P. insignis*, the Monterey Pine, 80 to 100 feet high, with clustered cones of rather large size, and remarkable for their very unequal development on the two sides. It is quite an ornamental species, and is frequent in cultivation in California. It is said to be much admired in Australia, where it has been introduced and where it flourishes.

Still farther down the coast from San Diego northward, for a distance of one hundred miles, another seaside Pine is found, the *P. Torreyana*, a small tree with large, thick and heavy cones, the nuts they contain being one of the food-supplies of the Indians.

There still remain to be mentioned a few species occupying a belt of country in Southern Arizona and New Mexico, along the Mexican border. These are: First, *P. Parryana* a small tree related to *P. edulis* and like it furnishing edible nuts; second, *P. Arizonica*, found on the Santa Rita Mountains, and related to *P. ponderosa;* third, *Pinus Chihuahuana*, which was first found in the Province of Chihuahua, Mexico, but has since been repeatedly collected in Arizona and New Mexico, and fourth, *P. reflexa*, found on the Santa Rita Mountains, and closely related to *P. flexilis.*

ABIES. In the genus *Abies*, as now recognized, are included those trees which are properly called Firs. In this genus the bracts of the cones are largely developed, being usually longer than the scales, sometimes conspicuously longer. The cones are always erect, and at maturity commonly fall to pieces, the scales and bracts breaking away from the persistent axis. The leaves of these trees are not arranged like those of Pines, in clusters, but singly and in two ranks on the twigs. They are mostly magnificent trees of pyramidal form and of rapid growth. We have in our district nine species; of these two are found in the eastern portion of the country, the others in the Rocky Mountains, and on the Pacific side of the continent.

Abies Fraseri, is a smallish tree found only on the high mountains of North Carolina. It is probably a vestige of the ancient forest vegetation which has been swept away from the lower ranges of the Apalachian chain by the great geological changes that have occurred on the Continent. The cones are 1½ to 2 inches long, the bracts exerted and reflexed at the points.

Abies balsamea, the Balsam Fir, is a tree of moderate size, having its chief development in Canada and the British Provinces. In Labrador it reaches nearly the 55th degree of latitude, running westward on the south side of Hudson Bay to the Severn River, thence striking northwest to Great Bear Lake and reaching Mackenzie River at 65°. Dr. Robert Bell says that it occurs in "the Maritime Provinces, Newfoundland, and the southern half of Labrador. It flourishes best in the Gaspe Peninsula, where I have seen many trees from twenty inches to two feet in diameter, with trunks large enough to afford one good saw-log—about fifteen feet. Southwest of Hudson's Bay it grows only in the warmest and best soils. In Ontario, where it is cultivated as an ornamental tree, I have not observed it growing naturally south of Toronto. It appears to be absent to the south and west of Lake Winnepegosis." It reaches the United States in Northern New England and New York, thence westward in Northern Michigan and Wisconsin. The bark of the tree, as in most others of this genus, has large blisters containing a thick balsam, which is largely collected and known in commerce under the name of "Canada Balsam." South of New York the tree is not very satisfactory in cultivation, as in age it assumes a ragged unattractive appearance.

In the Rocky Mountains we have two species; first, *A. subalpina*, growing on alpine peaks in Colorado, Utah, Montana, and extending into Oregon. It is nearly related to *A. balsamea*, but is a larger tree. The wood is very soft and white, but is said to be of little value for lumber. It was formerly mistaken for *Abies grandis*, which is confined to the western coast.

The second species of the Rocky Mountain region is *A. concolor*, the White Balsam, occurring in Southern Colorado, in Utah, Arizona and westward in the Sierras. It is a large tree, 100 to 150 feet high, and with a diameter of from 2 to 4 feet. The foliage is very pale on both surfaces, hence the name of White Balsam, or White Fir.

On the high Sierras of California and Nevada occurs the Red Fir (*A. magnifica*,) and farther north in the Cascade Mountains we find *A. nobilis* and *A. amabilis*, also called "Red Firs." They are all magnificent trees, growing at altitudes at from 7,000 to 10,000 feet and reaching a height of 260 feet or more and a diameter of from 6 to 10 feet. The wood is of a reddish color, strong and durable. The *A. magnifica* has larger cones than any other of our species. The cones of *A. nobilis* have the bracts extending beyond the scales and reflexed at the points like those of *A. Fraseri*, but 3 or 4 times as large.

Passing down the Sierras to the vicinity of the Ocean, extending from Northern California through Western Oregon into British America, we find *A. grandis*, probably the tallest Fir tree known, reaching a height sometimes of 300 feet, and a diameter of 4 to 6 feet. It is one of the most important timber trees of Oregon and Washington Territory.

There remains to be mentioned another species, *A. bracteata*, a tall, slender pyramidal tree, growing 100 to 150 feet high in the Santa Lucia Mountains on the west coast of California. It is restricted to a narrow belt extending about 100 miles in length. The cones have a very peculiar bristly appearance from the prolonged narrow bracts, which run out far beyond the proper scales, and are so slender and leaf-like as to suggest what is probably the true character of the bracts in all conifers, viz: that they are modified leaves.

PICEA. The next genus claiming our attention is that which is now called *Picea*, embracing those species which are called Spruce. In this genus the cones are pendulous, the bracts are shorter than the scales, and both are persistent on the axis, *i. e.* they do not fall to pieces at maturity. The leaves are commonly arranged spirally around the branchlets, sometimes becoming 2-ranked. Of this genus we have 5 species. Two of them belong chiefly to the Atlantic side of the continent—these are *P. alba* or White Spruce, and *P. nigra* or Black Spruce. But while they are eastern trees they are also far northern, extending indeed farther north than any other trees of North America. According to Dr. Robert Bell, they are abundant and of good size in Newfoundland and the Maritime Provinces, where *P. alba* is called "Sea Spruce." It is common in Labrador, although never reaching the sea coast. From near the 60th parallel this and *P. nigra* run westward to Hudson Bay, thence northwestward through British America north of Great Bear Lake, reaching the Arctic Ocean near the mouth of the Mackenzie River. Dr. Bell states that around James' Bay and between this bay and Lakes Huron, Superior and Winnepeg, they attain a good size for lumber. They do not extend far west of Lake Winnepeg, thence running southward they reach the United States in Northern Minnesota, Wisconsin and Michigan; eastward they appear in Northern New York and New England, and the Black Spruce extends southward on the Alleghenies as far as the mountains of North Carolina. In Maine these two species have supplied the Spruce lumber of the eastern markets.

The *Picea Engelmanni* and *P. pungens* are the two species of the Rocky Mountains, extending from New Mexico through Colorado and Utah to Idaho and Oregon. They are large trees growing on high ranges at elevations of from 7 to 10,000 feet, and are valuable timber trees. The *P. pungens* was for a long time known to botanists as *Abies* or *Picea Menziesii*, but it is now ascertained that that species is confined to the vicinity of the Pacific Coast, and for which the earlier published name of *P. Sitchensis* must be substituted. This latter species extends from Mendocino County, in California, northward through Oregon and Washington far into Alaska, probably to the Arctic Ocean, and is seldom found at an elevation greater than 500 feet. It attains a height, under favorable circumstances of 150 to 200 feet, with a diameter of 6 feet, and is a valuable timber tree.

The genus TSUGA includes what are known as Hemlocks and Hemlock Spruce. In this genus the cones are usually small and pendulous at the ends of the twigs, the bracts are usually shorter than the scales, and both are persistent on the axis. The leaves are flat or angled, 2-ranked on the twigs, and each with a short but distinct petiole. Of this genus we have four species.

First is *Tsuga Canadensis*, or Common Hemlock. This tree is confined to the eastern side of the Continent. Its northern limit passes from New Brunswick and Northern New England westward, crossing the St. Lawrence River, according to Mr. Bell, near Quebec, thence westward to the northern shore of Lake Superior. It does not appear to extend west of Lake Superior. In the States bordering the Great Lakes, and the Canadian line it prevails, and extends southward in the Allegheny region to North Carolina. The lumber is coarse, but strong and durable, and the bark is valuable for the use of the tanner.

Second is *T. Caroliniana*, which has but recently become known to botanists. It is found in the mountainous parts of North Carolina, and is closely related to the preceding.

In the highest timber region of the northern Sierras and the Cascade Mountains we find *T. Pattoniana*. It is said to be a very graceful tree, with slender branches and bright green foliage. The cones are of a peculiar purplish color, 1½ to 2 inches long. It is a large tree, and will probably be valuable for lumber. It has been known to botanists as *Abies Williamsonii*, but *Pattoniana* has priority as a specific name.

Our fourth species is *T. Mertensiana* or Western Hemlock. It grows in the coast region of the Pacific from Northern California to Washington Territory and probably farther north.

It grows from 100 to 150 feet high. It closely resembles the eastern Hemlock, (*T. Canadensis*,) but is said to have finer and straighter grained wood.

Recently botanists have admitted a genus of the name of PSEUDOTSUGA to designate a Spruce which has been long known as *Abies Douglasii*, or "Douglas' Spruce." The genus differs little from *Tsuga* except that the cones are larger, and the bracts are longer than the scales and project beyond them with a conspicuous three-toothed point, similar to those of *Abies nobilis*. It grows through a wider range than any other Conifer of the United States, extending from Oregon and

Washington Territory through the coast ranges of California, also on the western slopes of the Sierra Nevadas up to 6,000 or 8,000 feet altitude, and extending southward into Mexico, eastward through Arizona, New Mexico, Utah, Colorado, and northward to Montana. It is one of the largest and most useful of our Conifers, in Oregon and Washington Territory reaching its greatest development at the extreme height of over 300 feet, and furnishing timber for shipbuilding, masts, and for other building purposes. In the southern part of California there occurs a variety with unusually large cones, the variety *macrocarpa.* It is locally called "Hemlock," and grows 100 to 150 feet high.

Larix. We now reach the genus *Larix*, embracing the Larches. These are coniferous trees having deciduous leaves, which are narrowly linear and collected in fascicles of from 10 to 20. They have smallish cones with the scales usually shorter than the bracts. We have three species. First is the well-known American Larch, (*L. Americana.*) This is mainly a northern tree, and comes but little within the limits of the United States. Dr. Bell states that in Newfoundland and New Brunswick it attains a good size, and is a valuable timber tree on all the northern branches of the St. Lawrence and throughout Ottawa Valley, from which large quantities have been exported for ship-building, etc. It has an equally thrifty growth in the country to the south of James' Bay and westward toward Lake Winnipeg. Northward it reaches through Labrador to Ungara Bay, thence westward to Hudson's Bay; on the west side of which it is found at Fort Churchhill, thence northwestward nearly in a line with the White and Black Spruce to the Mackenzie River within the Arctic Circle. It enters the United States at the west and south of Lake Superior in Wisconsin, thence eastward in Michigan, northern New York and New England, where it grows mostly in cold swamps and wet woods. In the United States it does not seem to thrive well in cultivation, its European congener, the European Larch being much preferred.

Our second species is the Western Larch, (*L. occidentalis.*) This is a tree of noble size in the Cascade Mountains of Oregon, at elevations from 2,000 to 5,000 feet. The timber is strong and durable, and is used for fencing and course building purposes.

The third species, *L. Lyallii*, is a little known tree occurring also in the Cascade Mountains at high elevations.

Tribe TAXODEÆ. This tride includes the *Taxodium* or Bald Cypress, and the *Sequoias* or Redwoods. The scales of the fertile aments are thickened, woody, close, and spirally arranged. The ovules instead of being in pairs, are generally from 2 to 6 on each scale, in some genera erect, in others inverted. The leaves are two-ranked or imbricated, and alternate.

Bald or deciduous Cypress, (*Taxodium distichum.*) This tree occupies the Atlantic and Gulf Coast belt, extending also up the Mississippi River to Southern Illinois and Indiana. It is a large tree, reaching sometimes the height of 120 to 150 feet. The foliage is of a delicate fern-like aspect, and pleasing green color, but is all shed off in autumn. The wood is light, strong and exceedingly durable, and is much used for making shingles, railroad ties and common lumber. The roots often form large conical excrescences called cyprus knees, which rise above ground two to four feet.

SEQUOIAS. These are large trees, with short linear to ovate-lanceolate, carinate leaves, and comparatively small oval cones with thick wedge-shaped scales. We have two species:

1st. *Sequoia sempervirens*, or the Redwood of the coast ranges of California. It is a mammoth tree, but little inferior in size to its "big brother," growing from 200 to 300 feet high, and usually averaging from 8 feet to 12 feet in diameter, furnishing one of the most valuable kinds of lumber on the Pacific coast, but the forests are in danger of speedy extermination.

2nd. *Sequoia gigantea*, the Giant Redwood or Big tree. This mammoth tree, the wonder and astonishment of the world, grows on the western slopes of the Sierra Nevada Mountains, in or near Tularo County, in several small groves; at one point extended into a forest of 40 miles length, by 6 or 8 miles wide. These gigantic trees are, when height and diameter are considered, the largest trees in the world, some, by measurement, reaching over 350 feet in height, with a diameter of 35 feet. The trees in some of these groves are protected by law, otherwise we might expect the demands of speculation and gain to lead to their speedy extermination.

Tribe CUPRESSINEÆ. This tribe includes several genera, such as the Arbor Vitæs, the Cypress Cedars, and the Red Cedars. There is considerable diversity in the character of the fruits of these genera. The cone is small, and reduced to from 6 to 12 scales, which are not spirally arranged, but disposed in opposite pairs, crowded into a roundish ball, or forming a loose, oblong head of a few imbricated scales, or in the Red Cedar, (*Juniperus*,) the sexes are on separate trees and the fruit is berry like. The leaves are usually small and scale like, never two-ranked.

Thuja. This genus, according to the recent arrangement of Messrs. Bentham and Hooker is made to include three species which have previously been classed in *Cupressus* or *Chamaecyparis* and now embraces in our country five species. The cones or fertile aments are composed of 8 to 12 erect scales, with a pair of erect ovules at the base of each. The cones mature at the end of the first season and when mature become strongly reflexed. In the eastern part of the Continent we have two species.

1st. *Thuja occidentalis* or our native Arbor Vitae. The northern limit of this tree seems to be about the head of James' Bay, thence running eastward to the Gulf of St. Lawrence and eastward and southwestward to the eastern extremity of Lake Winnepeg, thence southward into the United States to the west of Lake Superior, thence in the States bordering the great lakes, into New York and New England. Although it is unusually large and fine in New Brunswick it is said to be absent in Nova Scotia and Newfoundland. It also sparingly extends southward along the Allegheny Mountains in Pennsylvania to North Carolina. It is, in some localities, called White Cedar, or simply Cedar. It is a tree of moderate height, of light, compact and durable wood and is very ornamental and hardy in cultivation.

2nd. White Cedar (*Thuja sphaeroidalis*). This was formerly called *Cupressus thuyoides*, or later, *Chamæcyparis thuyoides*. It is found in swamps near the Atlantic coast, from Massachusetts to Florida, and on the Gulf coast to Texas. There are are also a few isolated localities where it is said to occur, in

Illinois and Wisconsin. It is a small tree, 40 to 80 feet high, with a trunk 2 to 3 feet in diameter, with very durable and useful wood.

3rd. *Thuja gigantea*, or western Arbor Vitæ, extends from Sitka through the coast ranges of Washington and Oregon to Northern California. It is a majestic tree, sometimes becoming 200 feet high, and with a diameter of 10 to 15 feet. The timber is soft and valuable for building purposes.

4th. *Thuja excelsa*. This has been generally known as *Cupressus Natkanus* or Nootka Cedar. It ranges from Alaska southward to the Columbia River. It is a tree of 80 to 100 feet high, with soft, white, clear and valuable wood.

5th. Lawson's Cedar (*Thuja Lawsonia*). This is generally known as "*Cupressus Lawsonia.*" It is a handsome tree, growing in the Shasta Mountains, and northward in the Cascade Mountains. It is frequently cultivated and much admired for its beauty.

Bastard Cedar (*Libocedrus decurrens*). This genus is very similar to *Thuja*. The cones, composed of 4 to 6 leathery scales, do not become reflexed at maturity. We have but a single species growing throughout the coast ranges of the Pacific coast, from Oregon to San Diego, in Southern California, and in the Sierra Nevada Mountains at elevations from 3,000 to 8,000 feet. It is a handsome tree of conical form, growing from 100 to 150 feet high, with a diameter of 4 to 6 feet. It is locally known as "Bastard Cedar" and "White Cedar," and is said to be a useful timber tree, with a whitish, soft, durable wood.

CUPRESSUS. This genus differs from *Thuja* in a stiffer and coarser habit of growth, in having the much larger cones, composed of 6 to 10 very thick, peltale scales, which become a globose woody cone, maturing the second year. Our species are mostly Californian and some of them are yet imperfectly known.

1st. Monterey Cypress (*Cupressus microcarpa*). This species occupies a very restricted locality in the vicinity of Monterey, California, near the sea coast. It is a tree of 40 to 50 feet high, with a diameter of 2 to 4 feet, and is quite ornamental.

2nd. *Cupressus Goveneana* is a small tree growing in the coast ranges of California from Monterey northward, becoming sometimes 50 to 70 feet high, and said to be a beautiful tree.

3rd. *Cupressus Macnabiana.* This is a little known small tree or shrub, which is known to grow about Clear Lake in California and near Mount Shasta.

4th. *Cupressus Arizonicus*, a species of the mountains of Arizona, has been recently described under this name, of which we as yet know little.

JUNIPERUS. In this genus the foliage bears sufficient resemblance to the Arbor Vitæ and to *Cupressus* to indicate its relationship, but at first view of the fruit we shall not probably recognize any resemblance to a cone. We see only a small berry, with perhaps two or three seeds.

But in some of the species a careful examination will disclose the fact that this fruit is made up of half a dozen or more consolidated fleshy scales, in which the ovules are formed as in other conifers, but a large part of the ovules are abortive, so that only a few, and sometimes only one, are matured. In this genus, as we have before mentioned, the sexes are borne on separate trees. Of such as attain tree size we have four species and several varieties.

1st. Common Red Cedar (*Juniperus Virginiana*). This is one of the most widely distributed of North American conifers, occupying in greater or less degree most of the wooded portions of the eastern half of the Continent, extending into Texas and New Mexico, and in some varieties found in Colorado, Utah and northward, but not found in California and Oregon. Its northern limit is about the 45th° of latitude, occupying only a small district in Canada in the southern portion of the Province of Ontario.

It is a well-known and useful tree, the wood being almost imperishable. A variety or form of the species grows on the west coast of Florida, and furnishes the material from which the best lead pencils are made. Another variety is found in Colorado and Utah.

2nd. California Cedar (*Juniperus Californicus*). This species grows in the coast ranges of California, and on the eastern slopes of the Sierra Nevadas, extending into Arizona and

Utah. It is a low, bushy tree, 10 to 30 feet high, and is chiefly useful for fuel.

3rd. Oregon Cedar (*Juniperus occidentalis*). This species occurs in the Cascade Mountains of Oregon and southward in the higher Sierras, and a variety is said to occur in Colorado, New Mexico, Western Texas and Arizona.

4th. Arizona Cedar (*Juniperus pacyphlœa*). This is a middle sized tree of Southern New Mexico and Arizona, with a spreading rounded top, a thick, rough bark, which is checked like the back of a Pine, and with large, sweetish fruit, which is used as food by the Indians.

Tribe TAXACEÆA. Lastly we have a tribe of Yews or Yew-like trees. This tribe differs so much from ordinary conifers that it has by some botanists been considered a distinct order. The latest authority, however, reduces it to a tribe, of which we have two genera, viz., *Torreya* and *Taxus.* Its distinctive feature is the reduction of the cone to a single ovule, which in fruit becomes a bony-coated seed more or less surrounded by a fleshy or pulpy covering. The leaves are flat, linear and two-ranked. The flowers are diœcious, axillary and solitary.

TORREYA. Of this genus we have two species, one of which, *Torreya taxifolia,* is confined to a small locality in the north-western part of Florida, where it is a small tree from 20 to 40 feet high. The leaves have a strong, disagreeable smell, giving rise to the local name of "Stinking Cedar."

The other species is *Torreya Californica,* and grows sparingly in the coast ranges of California and on the west slopes of the Sierra Nevadas. It is a tree of 50 to 75 feet high, with slender, drooping branches, and sharp-pointed, stiff, two-ranked, Yew-like leaves. The fruit in both species is of the size of a small Hickory nut. The large seed inclosed in the hard inner covering or shell has a rugose and mottled appearance resembling a nutmeg, from which the western species is called the California Nutmeg tree. It has, however, none of the properties of the true nutmeg nor any botanical relationship.

Of this genus there are only two other known species, one in China and one in Japan. The wide separation of these species at the present time leads to an inquiry as to the cause. The presence of the two *Sequoias* on the Pacific coast, and not elsewhere, presents another question of the same nature.

This question has been very ably considered by Dr. Asa Gray,* and the conclusion is reached that these genera are but vestiges of an ancient forest vegetation of the Miocene period, as proved by the occurrence of fossil specimens not only in our country but in Greenland and Southern Europe.

Of the genus TAXUS or Yew proper, we have as trees only two species, one eastern and one western.

1st. *Taxus Floridana*, the Florida Yew, is a small tree from 10 to 20 feet high, growing in the same district as *Torreya taxifolia*, in Northwestern Florida, in a very limited area. The fruit is a small red berry.

2nd. *Taxus brevifolia*. The Western Yew grows in the Sierras of California, and northward to British America. It is a small tree, seldom more than 20 to 25 feet high. The small red berries remain on the tree until late in the fall, and are said to be gathered for food by the Indians.

In closing this paper I wish to acknowledge my obligations for much information to Dr. Geo. Engelmann's "Revision of the genus *Pinus*," also to the valuable pamphlet of Dr. Robert Bell on the "Geographical Distribution of the Forest Trees of Canada."

ON THE DISTRIBUTION OF THE MORE IMPORTANT TREES IN THE GULF REGION.

BY DR. CHARLES MOHR, MOBILE, ALA.

(Continued from page 126.)

PART 2. HARDWOOD TREES.

THE Gulf Region, which may be bounded eastward by the Chattahoochie River, westwardly a line from the Upper Trinity to the Lower Brazos (forming the western boundary of the great eastern North American forest,) and northward by the boundaries of the states lying on the Gulf Coast,—presents, in the character of its tree growth, features of great uniformity, which differ but little from the forest flora of the lower Atlantic Southern States.

The Gulf Coast of Florida, although much like the littoral region of the mainland westward to the Mississippi, in its vegetation, belongs to the distinct floral province, peculiar to the Florida Peninsula, in its presenting tropical forms, under somewhat different climatic conditions, of which but faint traces are found in the Gulf Region as above described. There is scarcely a single instance of a truly arborescent plant, which may be regarded as exclusively limited to the region under notice, even among those of most local distribution. Of the 202 species enumerated in Prof. Sargent's Catalogue of eastern North American trees, (to which must be added the *Rhus cotinoides Carya olivaeformis*, *Quercus Durandii Myrica cerifera* and *Aluns serrulata*, the last two reaching the size of small trees in lower latitudes), 128, or 62 per cent. may be found in the Gulf Region.

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*Vegetation of Rocky Mountain Region, Bulletin of Hayden's Survey, Vol. VI., p. 62.

From the want of data needed for marking the strict geographical limits of each species, as well as from uncertainties as to specific characters, it is quite impossible to fix with certainty the number of species that may be regarded as typical in any floral division. It may come near the truth however, if we notice of the 128 species found within the Gulf Region, the following as types strictly limited to the lower South, and not straggling beyond 35° N. latitude, viz: *Magnolia cordata*, and *M. grandiflora*, *Cliftonia ligustrina*, *Cyrilla racemosa*, *Sapindus marginatus* (according to specimens in Ridell's herbarium from Western Louisiana), *Rhus cotinoides Prunus Caroliniana*, *Crataegus arborescens* and *C. æstivalis*, *Nyssa Caroliniana*, (if found on further investigation, distinct from the northern *N. multiflora*), *Nyssa capitata*, *Halesia diptera*, *Catalpa bignonoides* (said to be further north entirely replaced by the *C. speciosa*), *Carya aquatica*, *Quercus Durandii*, *Q. Catesbaei*, *Pinus glabra*, and *P. Cubensis*,—in all 18 species.

The following trees found only along the Atlantic seaboard, beyond the northern limits of the lower South, find in the Gulf Region their best development and widest distribution, and may therefore be regarded as therein properly at home, viz: *Pinus australis*, and *P. taeda*; *Quercus virens*, *Q. cinerea*, *Q. aquatica*, and *Q. Michauxii*, *Planera aquatica*, *Persca Caroliniana*, *Osmanthus Americana*, *Xanthoxylum clavi-Hercules*, *Cratægus apiifolia*, *C. flava*, and *C. spatulata*, *Fraxinus platycarpa* and *Magnolia glauca*. All of the larger trees in this list tend to give a decidedly characteristic feature to the forests of the Gulf Region and the Lower Atlantic coast, and must therefore be regarded as but a slight Northern extension of Southern forms.

The following Northern species find their southern limit in our Gulf Region: *Tsuga Canadensis*, *Betula lenta*, *Quercus palustris*, and *Q. macrocarpa*, *Q. imbricaria*, *Juglans cinerea*, *Fraxinus pubescens*, and *F. quadrangulata*, *Crataegus tomentosa* (var. *punctata*), *Acer saccharinum* and *S. dasycarpum*, which find their way several degrees further south near the western confines of our region, and beyond in Western Texas.

Commencing an enumeration of species with the amentaceous order, the Oaks claim our first notice; but among the 19 or 20 found, not one can be claimed as peculiar to the forest flora of the Gulf Region. The Texan White Oak (*Q. Durandii*) extends into the province of the Texano-Mexican flora; the *Q. Catesbaei* is strictly limited to the lower Southern States; the *Q. virens*, *Q. cinerea*, *Q. aquatica*, and the *Q. Michauxii*, are eminently southern, while the *Q. phellos*, *Q. Muhlenbergii*, *Q. lyrata* *Q. macrocarpa*, *Q. stellata*, *Q. alba*, *Q. falcata*, *Q. coccinea*, *Q. tinctoria* and *Q. nigra*, are shared in common with the Middle and Northern States. Of those of more decidedly northern range, the *Q. prinos*, *Q. tinctoria*, *Q. coccinea* and *Q. Muhlenbergii*, are limited to the mountains in the northern border of the Gulf States.

With this general glance at the distribution, we will now pass to consider the more important species:

1. THE LIVE OAK, (*Q. virens*,) in majestic beauty of growth, and excellence of timber, ranks among the first of North American oaks. It extends from Western Texas eastward across the maritime plain of the Gulf States, and according to careful observation, scarcely extends north of 31° of latitude in Louisiana, Mississippi, and Alabama. It is of a low, sturdy growth, and reaches a diameter rarely exceeding two and one-half feet, spreading its horizontal branches at a height from twelve to fifteen feet, with an ambitus of from 130 to 160 feet. No opportunity was offered for measuring with accuracy the height of full-grown trees, but it can be estimated as rarely exceeding 60 or 65 feet. It grows in a warm, loamy soil, retentive of moisture and free from over-

flow, such as is found in the best class of dry hummock lands, where it once formed park-like groves of considerable extent, and along the shores of the Gulf and the numerous bayous and inlets, in a lighter, sandy soil. Of the splendid trees which once fringed these waters, but comparatively few are now seen. It covers the drift-sands on the sea-shore and the outlying islands with dense thickets, in a soil where under the burning summer sun, and exposed to the storms, it remains of small size, and trees from 10 to 12 inches in diameter, are mostly found affected with decay.

Since the introduction of iron in naval construction, the demand for this timber has greatly decreased, and it is only in the smaller craft, that it has not been entirely superseded. It grows well in even a poor surface soil if underlaid by clay to render it somewhat retentive. Trees have been found in Mobile county not over 70 years old, that were 2 and 2½ feet in diameter, at 3 feet from the ground. This affords a striking instance of rapid growth, and great compactness, strength and durability in its wood. It is often planted for ornament in streets and parks, in cities and on the broad lanes in the country, and its cultivation in the lower South can not be too strongly recommended as a profitable investment.

2. The Swamp-Chestnut Oak, Basket-Oak, or Cow-Oak, (*Q. Michauxii.*) This tree is of decided southern range; it extends westward to the valley of the Trinity river, and fine specimens have been observed at Palestine, Tex. It is not common in the coast region, but is seen of finest growth in the deep forests covering the bottoms, with a damp soil, rich in vegetable matters and subject to occasional overflows throughout the central parts and northward. In the primeval forests yet found in the valleys of Central and Northern Alabama, and to a large extent in the broad tracts of rich level lands in the upper parts of Mississippi, especially in the Yazoo and Mississippi delta and those bordering upon the numerous larger tributaries of the Yazoo, viz., the Coldwater, the Tippah and Tallahatchee, it is the prevailing timber tree. Associated in these forests with the White Ash, Hickories, Red Maple, the Spanish Oak and the Sweet Gum the basin of the Yazoo river still embraces the greatest stores of the most valuable hard-wood timber found south of the Ohio river. It

is found mostly of a diameter varying from two to three feet, by a height from 90 to 100 feet and over, with a clear trunk to over half its height. On the banks of the Tuscumbia river in Mississippi 15 trees of such dimensions have been counted on one acre, and similar observations have been made on Indian Bayou, a tributary of the Sunflower river, in the Yazoo Valley.

But few seedlings and trees of smaller growth are observed in the deep forest; they are also seldom seen amongst the second growth in the openings of the woods. It ripens its fruits in abundance in the same season that it blossoms. The large acorns are less astringent than those of the White Oak, and are said to have been frequently resorted to after having been roasted as food by the Indians, and in time of scarcity, also by the negroes. This tree forms the great body of the Oak growth in the Gulf region; abundant, and in the qualities of its woods in no way inferior to the White Oak, it must be regarded as the most important hardwood timber tree of the South. Its wood splits well and is easily separated in thin flexible strips of great strength, which are employed in the manufacture of the baskets used in cotton picking. The number of trees annually cut down to furnish the material for these baskets, used on all the cotton plantations throughout the Gulf States, must indeed be very large. For wagon-making and all kinds of wheel-wright work its timber is used with the greatest advantage, and no other region can offer better inducements for the establishment of wagon manufactories and of agricultural implements. What can be accomplished in that respect is duly demonstrated by the extensive works of the White Oak wagon manufactory at Holly Spring, Miss. Considering the increasing demand for its useful timber, and growing upon a soil highly adapted for the cultivation of the great staples of the country, the extinction of this fine and useful tree in its native woods will be a mere question of time.

3. WILLOW OAK (*Quercus phellos*). This, like the preceding, is prevailingly southern in its distribution, and is often found associated with it throughout the Eastern Gulf Region and Louisiana, but is rarely met with in Eastern Texas. It has been found of large size in the low, damp forests of the Yazoo River, on

the borders of swamps and streams of large size, and groups of trees have been there observed near Indian Bayou, none of which measured less than two feet in diameter. The girth of the largest one measured was 12 feet, 2 inches, at four feet above the ground. It is found smaller but very frequent in the hummock lands of the lower pine region. The wood of the Willow Oak is compact, hard, and said to possess the elasticity that adapts it for use in railway cars for uprights and cross-pieces. The tree is a free seeder, of rather quick growth, and like the Live Oak, is frequently planted in the Coast Region as a shade tree. Its offspring is found abundantly among the second-growth in the openings in low places with a damp, cool soil.

4. OVER-CUP OAK, SWAMP-WHITE OAK (*Q. lyrata*). This species is most common in the northern and central parts of the Eastern Gulf Region, as far south as Gainesville, on the Pearl River, and below the junction of the Chattahoochee and Flint rivers, on the banks of the Apalachicola. West of the Mississippi it is less common, and in Western Texas it is scarce. It prefers a wet soil, exposed to frequent inundations, and is most common in the submerged swamps and shallow ponds on the bank of the larger streams throughout the upper pine region of mixed growth, and northward. On the Chickasaha River, near Enterprise, Miss., trees have been measured three feet in diameter. The wood is heavy, fine-grained, harder and less easily worked than the White Oak, and is deemed equally valuable. As it is limited to localities difficult of access, and to ground not adapted to cultivation, its future is better assured than other oaks valuable for their timber.

5. WHITE OAK (*Q. alba*). This oak, which has the widest distribution north and south, is equally common throughout the Gulf Region. Upon the thin and silicious soils of the coast region east of the Mississippi, it is only occasionally found, on spots favorable to its growth, to attain its full size. In the upper pine region of Alabama and Mississippi, and northward throughout Louisiana and Eastern Texas, on lands of a warm, generous, loamy soil, it is met in full perfection. In the rich valleys of the mountain region of Alabama, trees four feet in diameter are not uncommon.

(*To be continued.*)

MISCELLANY.

The Increased Value of Farms from Road-side Planting.—We can not too frequently or too strongly urge the importance of planting as a profitable investment, from the amenity that it gives to the place where it is practiced, to say nothing of the benefit that may casually be derived from the value of the wood that is grown. Mr. W. A. Hale, of Sherbrooke, Canada, in a paper read at the Forestry Congress, in noticing the benefit of Road-side Tree-Planting, from this point of view, remarked:

"How often do we hear the remark when pointing out a valuable farm to an intending settler who appreciates the beauty of scenery and the comfort of cool and refreshing shade. 'It won't suit; there is not a tree near the place,' or 'I would not take the place at any price; there is not a tree to be seen.' I know of one man, a blacksmith, by trade, who was possessed of taste and foresight beyond what one might expect from a mere wielder of heavy hammers, who, some fifteen years ago, indulged in what might now be termed an 'Arbor Day,' and with axe and spade, prepared and planted some two hundred poles of the common White Willow (*Salix alba*), on both sides of the high-road, which crosses a sandy portion of his farm, at regular intervals of about forty feet. No further trouble was taken and very few failed; but year by year his place became more and more attractive, and people now sought in their drives for pleasure, the once sandy, but now cool and pleasant avenue, and when a short time since his farm was known to be for sale, he found a ready and eager purchaser, in one whose choice was largely influenced by the handsome double row of almost overarching trees, which gave the name of 'Willowdale' to this once uninteresting spot. Many instances of a like nature might be quoted, but the fact having become established beyond the shadow of a doubt that road-side tree culture is financially a thing worthy of the efforts of all, the next thing is to ascertain the surest way of accomplishing the end aimed at."

He suggests that this may often be done, by saving and trimming away from around the young trees that spring up spontaneously along the corners of the fences, where suitable kinds may often be found that come up from accidental seeding, and which may be made the finest of shade trees with a little timely care.

If this could be done under the public authorities, in the annual work of road-repairs, it would give a uniformity in the result, and convey the impression that the government took an interest in the proceeding. This is precisely what is done by the government in many countries of Europe. In Germany, we see lines of apple trees upon both sides of the public roads, planted and owned by the government to mark the line of the route. In the absence of fences, they afford convenient land-marks and their fruit is there sold in convenient lots, from a certain number of trees at a time, the proceeds being applied to pay the expenses of maintenance. But counting the fruit as of no value, there are manifold advantages resulting from the practice, and for marking the line of road across a prairie, in the absence of fences, they would be of incalculable benefit. Mr. Hale, in noticing the species which, in his opinion, should be preferred, after condemning the Aspen (*Populus tremuloides*), on account of its liability to injury from the borers, and the Red Cherry (*Prunus Pennsylvanica*), from the temptation it presents to the boys, says:

"The Elm in most cases I should

prefer to any of the maples, as being a faster grower and a more healthy tree. Basswood, Butternut, Brown Ash and the White Willow, all are good; the Beech is useful but not healthy and seldom ornamental; of the Conifers I should prefer the Double Spruce (*Picea nigra*) to the common Red Spruce, as being more hardy and a very much more handsome tree. Pine, Tamarac and Balsam, the so-called Cedar (*Thuja occidentalis*) and Balsam are all desirable though many of the latter were winter-killed during the past season. To those who shrink from the task of selecting and transplanting a large variety, I should say, do not give up but throw in your lot with the White Willow, it makes a very rich and handsome tree of quick growth; its shade is very dense; it does not throw up suckers; its wood is becoming valuable, and its straight branches can be made use of in very many ways in the garden; it is the first tree to give us warning that spring is at hand, and the last to lose its bright green leaves in the autumn, and its golden tassels in early May are the hope and home of the frugal bee, from which he gathers his first pollen before the harvest time of honey has been developed by the more tardy flowers. As an example of the far-reaching benefit of arboriculture I will give the history of probably the first importation of any new variety of tree ever made into the Eastern Townships. Many years ago a solitary horseman might be seen wending his way, from the central part of Vermont, bearing in his hand a riding stick broken from a tree as he left home. His destination was Lennoxville, and in due course of time he arrived, and taking up his abode at a farm-house about one mile east of the village, stuck his now useless switch into the ground. Like Aaron's rod, in due time, it budded and grew apace—a scion of the then unknown White Willow. From this little stranger have come all the original magnificent trees for which Lennoxville and the surrounding country have been so long and so justly famous, and which have done so much towards clothing the country side for miles around with its rich and luxuriant foliage; into many other towns and villages have they spread until the offspring of this embryotic Willow might be numbered by the thousand."

The Growth of Wood for Charcoal.—Mr. Edward Haycock, of Ottawa, President of an Iron and Steel Manufacturing Company at that place, in a paper read at Montreal, in August last, after noticing the vast capabilities of Canada for the production of timber, and the extent of some existing woodlands, remarks that these lands will cut from 20 to 80 cords to the acre. Taking the average at 50 cords, making 40 bushels of charcoal to the cord, we find that a ton of iron is made from four cords of wood, or at the rate of twelve tons to the acre. With proper care and supervision in the growth of young wood, the supply may be regarded as practically inexhaustible in the future. Wood-charcoal, in order to be valuable, must be within a reasonable distance from the ores that it is required to smelt. He proceeds to draw comparisons between the situation of Canada and other countries in this respect. In Spain, Algeria, and the Mediterranean islands, they have rich ores but no wood. In England it is the same; in Norway, partly so; and Sweden, at present a great steel-producing region, is rapidly approaching the same position, as are also Germany and France. He regarded the consumption going on in the United States as fast gaining upon the supplies, and with the rapid increase of charcoal blast furnaces, it would hardly be able to keep up the supply for a long period. Internal troubles in Russia were disturbing her internal industries, were rendering her productive resources uncertain, and from these data he drew the inference that there were great reasons for hope in Canada, as the great steel-producing country of the world. He noticed the waste of fuel going on at the extensive saw-mills of the country, and in the clearing up and settlement of new lands, as a subject demanding attention, and insisted upon the urgent need of Legislative measures to prevent further waste.

The Elder.—A person acquainted only with the native Elders of the United States might feel surprised at seeing this species mentioned (as on page 102 of this Journal,) among Forest trees desirable for plantation. The principal European species (*Sambucus nigra*), is found in various parts of Europe, in Northern Africa, and in Siberia, growing in Great Britain, to the height of twenty feet, and in warmer climates to twice this height. The young wood is pithy and brittle, but when old it becomes hard, of a glossy yellow, and susceptible of a fine polish. It is used in turning, in the manufacture of mathematical instruments, combs and other purpose for which boxwood is commonly employed. Its flowers have a faintly nauseating odor, and the berries are used in making wine. The blossoms and bark have been employed from ancient times in medicine, but are now not much used. It is propagated with great facility, and is most valued as a nurse or screen for other trees, as it bears very well a bleak exposure, and the strong sea winds. The shoots in the tree-top grow sometimes five or six feet in a season, and the rods, which are very pithy, much resemble the stems of our *Sambucus Canadensis*, or common Black Elder. The specific gravity of the wood varies from 0.565 to 0.693. The *Sambucus racemosa* is of smaller size, and both are highly ornamental, when seen at some distance, in full bloom. They are scarcely of value for cultivation, on account of the wood they produce, but are sometimes incidentally turned to profit in the manner above indicated.

Membership in the American Forestry Congress.—It appears from inquiries, that there is some misunderstanding upon this subject. Any person, upon the recommendation of two members, and the payment of $2, may join and be entitled to all the privileges of membership. The annual dues are $1. MR. JOSEPH S. FAY, who was elected Treasurer at the Montreal Meeting, having declined, DR. CHAS. MOHR, of Mobile, Alabama, was appointed in his place by the Executive Committee.

As it is very desirable that the list of members to be printed in the Proceeding, be as full and correct as possible, those who wish to have their names included, should not delay sending him their dues, in order that they may be properly entered.

The Use of Fences.—Young plantations of forest-trees need protection quite as much as a corn field. Not only are they wanted to keep off domestic animals, but also in exposed places as a screen against the winds. Wire fences are almost always cheaper, and often better, than those of any other material for the former use, but they are not for the latter. With a line of brush behind them, they will, however, answer the requirement in most cases.

Differences in the Vitality of Seeds.—The careful farmer in selecting seed corn, chooses the ears that are well developed and without shriveled kernels at the end. There is a notable difference in the quality of the seeds of cones, and of trees, other than the coniferous, generally. The middle part bears the best seed, and a very marked difference will often be noticed between the plants grown from such seeds, and those less fully developed near the end.

Forestry Association of the Province of Quebec.—This Association was formed early in October last, and has for its object to secure the efficient protection and proper management of the standing forests, the re-wooding of denuded districts and the encouargement of planting of the most valuable kinds of forest trees suited to their soil and climate.

It requires of its members that each one who owns land fit for the purpose shall plant at least 25 trees, giving them proper care, and reporting their operations to the Secretary. From those who can not plant, the dues are $2 a year. The Association will endeavor to establish Branch Societies, or secure representative members in every municipality of the Province. The officers and Delegates of the American Forestry Congress, are made *ex-officio*, members of the Association. The direction of affairs is intrusted to a Council, composed of an Honorary President, President, two Vice-Presidents, a Recording and a Corresponding Secretary, a Treasurer, and sixteen members. Five of these form a quorum. The Council will appoint a General Committee in different parts of the Province, who will be notified of the meetings of the Council, and have a right to attend and take part in its proceedings. Besides such general meetings as may be called there will be an annual meeting at which elections will be had. The seat of the Association is fixed at Montreal, and the officers for the first year are as follows:

Honorary President: Mr. James Little, *Montreal.*
President: Hon. H. G. Joly, *Quebec.*
Vice-Presidents: Messrs. J. K. Ward, *Montreal*, and L. H. Massue, M. P., *Varennes.*
Recording Secretary: Mr. J. X. Perrault, *Montreal.*
Corresponding Secretary: Mr. Ed. A. Barnard, *Cap St. Michel.*
Treasurer: Mr. G. L. Marler, *Montreal.*
Council.—*Montreal:* Hon. Louis Beaubien, Messrs. William Little, Henry Lyman, Dr. Henry Howard, Henry Evans, J. A. U. Beaudry, and William Robb.—*Abbotsford:* Chas. Gibb.—*Quebec:* Colonel Rhodes, Louis Bilodeau, S. Lesage.—*Longueuil:* J. M. Browning.—*Chateaugay:* R. Jack.—*Three Rivers:* J. B. Normand.—*St. Roche-des-Aulnaies:* A. Dupuis.—*Bécancourt:* A. Blondin.

Roadside Tree Planting in Connecticut.—By an act approved April 12, 1881, every person planting, protecting and cultivating Elm trees not more than sixty feet apart, or Maple, Tulip, Ash, Basswood, Oak, Black-walnut or Hickory, not more than thirty feet apart, for three years, for the space of a quarter of a mile along a public road, is to receive an annual bounty thereafter of $1 for each quarter mile so planted and cultivated; to be paid out of the State Treasury, but for not more than ten years.

Planting on the Dunes at the Golden Gate.—The *San Francisco Weekly Bulletin*, of November 29, 1882, has the following interesting information: "For the past few weeks the western end of Golden Gate Park has presented the appearance of a busy farm. About thirty men and three teams have been at work with the following result:

Nine thousand young Pines and 3,000 young Eucalyptus trees have been planted, and about one hundred acres of previously verdureless sand dunes planted with "bent" grass. Until the past two years the subjugation of the shifting sands at the western end of the park was an uncertain problem. Brush fences had proven quite unsatisfactory. Nor had the lupine fully fulfilled expectations in that locality. Covering the unstable dunes with coherent soil—a slow and expensive process—seemed the only remedy. But two or three years ago the 'bent' grass, which now borders the western end of the main park drive, where it had been planted, began to assert itself. It soon became evident that this grass was of such prehensile growth that ordinary movement of the sand surface had no effect upon it, while, if such violent displacements took place as were often occasioned by storms, this invincible sand subduer forced its way up through the overlying drift, and went on growing as if nothing had happened. This last almost unique vegetative trait was quite opposite to the ready discouragement of the young pines, gums, acacias and other transplanted trees and shrubs. When once covered by the drift their usefulness was at an end. There is an extensive miniature forest buried under the sands of Golden Gate Park already.

"It is a peculiarity of the apparently sterile wastes, which make up the greater portion of Golden Gate Park, that the nearly pure sand of which they are composed retains perennial moisture at a depth of a few inches, and that this moisture is in inverse proportion to the amount of vegetable matter in combination with the sand. For this reason it is easy to keep young trees growing through the driest season, if their two arch enemies—namely, sand drifts and cotton-tail rabbits—can be kept in check. Hitherto plantations of young trees have been successfully raised only where peculiarities of topography afforded them some protection at least against the encroachment of the sand drifts. The advent of the 'bent' grass, it is believed, has simplified the problem of reclamation. Wherever this wonderful plant obtains a foothold it remains. The 'bent' grass is—superficially, at least—identical with a grass which grows in different portions of the sandy coasts encircling the North Sea. Its introduction in Golden Gate Park is an event not the less fortunate that it was also fortuitous."

What to Plant for Groves and Wind-Breaks.—In a paper transmitted to the Montreal Meeting of the American Forestry Congress, Mr. Suel Foster, of Muscatine, Iowa, after noticing the public and private benefit from the planting of trees, in the climatic influence, the beauty of the landscape and the lawn, and the protection afforded from the violence of the wind, and the northern "blizzards," in which each tree contributes towards the desired object "as does each vote for the election of a President," he proceeds to notice the economical points to be considered, in regard to this subject, and says:

"We must convince the farmers that there is money in tree planting. First, to plant an acre of trees on the North and West sides of a forty-acre field or pasture, which will cover a belt one rod in width, and to plant four rows four by four feet will take two thousand, seven hundred and twenty-two trees, at $20 a thousand for two year old trees, will cost $54.44. To plow, plant and cultivate two years, $45.

"We often see the farmer build a $2,000 house and a $1,000 barn, and leave his fields, his buildings and his animals unprotected by belts of trees from the rushing winds, which are sure to come both summer and winter, doing far more damage than we usually estimate.

"Now let us see what the value of the belt of trees will be. In five years they will be fifteen feet high, and four inches in diameter. He may then fasten the fence wire to the trees for a fence; thus saving three hundred and twenty posts on two sides of a forty-acre lot, one hundred and forty rods, which, at twelve and one-half cents, would amount to $40, stating the posts $20 credit in Iowa, (and may be the case in other States, or ought to be) exemption on $100; valuation tax, $1.50; for ten years, $15. Credit by thinning out one thousand poles at two cents, which may be used for fence stakes, etc., and firewood. $20. Now we have a credit of $35, and the belt of timber standing four by eight feet apart on two sides of the forty-acre lot. If the farmer lacked the $100 to buy the trees and set them out, would it not be economy for him to diminish the cost of his house or barn, or in some other direction to save, or sell something and raise this $100 and plant this acre of timber? And it certainly would be advisable for every farmer whose farm is not protected by natural belts of timber to continue this planting annually until he has one-tenth of all his land set to forest trees for timber, wind-breaks and fuel.

"This debt and credit of timber planting for wind-break and wood ought to be considered farther. How few consider the amount of water daily taken up from the soil by the sun and wind? In the spring of the year the soil usually contains about one-third its weight of water, or if it was extended it would measure six inches of soil and sub-soil. There usually falls about three inches of rain-water in a month, mostly evaporated by the sun, some running off, some filtered down. If little or no rain falls for a month, crops begin to suffer, and in two months, if no rain falls, the crops are mostly ruined, for the water is nearly all evaporated for a depth of twelve inches. The moving of the air, the wind, has contributed largely to dry the soil. The belt of trees around the farm checks the wind and modifies the drouth. It also prevents the strong wind from switching the growing crops about, tearing the leaves, breaking the stalks, and sometimes laying them flat. These benefits of the wind-breaks the farmers seldom understand or place to the credit of the wind-break.

"I have lived over forty years in the prairie country of Iowa and Illinois, and traveled over them considerably before the settlement, when the woodlands were mostly confined to the valleys of streams and broken bluff lands; but now most of the farms have more or less trees, but very few have trees enough on the prairie farms for use, and for the best condition of the farm; but what planting has been done has added greatly to the beauty and comfort of the farm as well as its increased value. I think the work of planting trees is on the increase in proportion to other improvements, especially the string of trees eight feet apart for a line of live fence-posts where a permanent fence is to stand.

"We have so much reliable evidence and experience with the Hardy Catalpa (*speciosa*) that we are fully satisfied that it is the most valuable tree for the farmer to plant south of forty-three degrees, and in some parts of our country it will stand the winters further north. It is easily transplanted, retaining life through long carriage and much drying, will grow faster than any of our forest trees except Cottonwood and Willow; its lasting qualities for fence posts, railroad ties, etc., exceeds any one we have except Red Cedar, and it may last longer than that when the experiment is tried fully. It is a beautiful wood for inside finish of houses, railroad cars, and for cabinet work. The White Ash is in my estimation, the second best tree to plant. It grows reasonably fast, and is the best wood for nearly all our farm tools and machinery; although the Cottonwood will answer for many farm tools, it is not quite as strong but much lighter, hence the farmer should plant about one-eighth as many White Ash as he does Catalpa.

"Now we have named two trees, the most select list out of one hundred varieties, why should we confuse, confound and incumber the tree planters with the other ninety-eight? I know of no use for wood but that the two above named varieties can conveniently be applied:—fences, railroads, tools and machinery, building and fuel. A few evergreens, pine and spruce, about the house and stock yards for ornament and winter protection, and the farm is in proper condition for a comfortable home."

Massachusetts Law Against Forest Fires (April 19, 1882): "Whoever wantonly and recklessly sets fire to any material which causes the destruction or injury of any growing or standing wood of another, shall be punished by fine not exceeding one hundred dollars, or by imprisonment in the jail not exceeding six months."

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Suggestions Regarding Forest Administration in the Northwestern Provinces and Oudh. By D. Brandis, F. R. S., C. I. E., etc. Calcutta, 1882. Folio, pp. 157, with maps and plates.

South Australia: Woods and Forests; Annual Report of the Forest Board, with Conservator's Progress—Report and Appendices for 1880-81.—Adelaide, 1881. Folio, pp. 48, with 4 maps. The same for 1881-82. Adelaide, 1882. Folio, pp. 29. Mr. John Ednie Brown, F. L. S. Conservator, is a son of Mr. James Brown, author of a highly esteemed work, entitled "The Forester," (of which the 5th edition is in preparation if not published), and a brother of William Brown, Professor of Agriculture at Guelph, Ontario. The first of these reports, gives a concise account of the operations of the Board, for the previous year, and plans for future management. The Board had seven plantations reserved, containing 2,617¾ acres in all, and has planted during the year 238,845 trees. They had planted 323¾ acres; had sown 323 acres with tree-seeds, and encouraged the re-stocking of 216 acres with indigenous trees. The season's work has been very satisfactory, and of the whole number of trees started, 232,000 were growing. Of these, 198,000 had been planted, 12,000 sown *in situ*, and 22,000 were from natural reproduction. The Board has endeavored to interest the farmers in planting, and in speaking of this subject say:

"It is satisfactory to be able to report, that the public generally in the Colony are now taking very considerable interest in arboricultural matters, and that a considerable number of the landed proprietors of the country are beginning to form plantations upon their holdings. The importance of this in our sparsely timbered land, can not be too highly estimated. It is a step which, if kept up and extended, will be productive of much permanent good to the Colony at large."

The first bonus of $2 per acre for planting had been granted under the act of 1873, upon 68 acres. This had aroused public attention to the matter, and was likely to induce others to plant.

The last report shows that the drouth had seriously affected their operations, but notwithstanding this severe trial 112,000 planted trees had survived. The non-official members of the Forest Board having resigned, the work of the Department has been assumed by the executive officers; under Hon. Commissioner of Crown Lands.

A Practical Treatise on Tree-Culture in South Australia.—By J. E. Brown, F. L. S., Conservator of Forests for the Government of South Australia. With numerous illustrations, by J. W. Love. Adelaide, 1881. 8vo., pp. 116.

This little manual was prepared for encouragement of those who were unaccustomed to the proper methods of planting, but who were desirous of undertaking it, with the view of supplying information suitable for the soil and climate of Sonth Australia. It is admirably arranged and illustrated by numerous lithographic plates.

Die Lauinen der Schweizeralpen, Von J. Coaz, *Eidgenössischer Oberforstinspektor.* [The Avalanches of the Swiss Alps. By J. Coaz, Federal Forest Inspector.] Bern, 1881. 8vo. pp. 147, with maps and plates.

This is a small government publication that has grown out of the measures organized under the amendment of the constitution adopted in April, 1874, giving to the Federal Union the right of supervising structures for the protection of water-courses; and of the forest-police in the mountain regions, including the planting of forests, and whatever regulations may be found necessary for maintaining the works and the forests already existing.

Estadistica de la Produccion de los Montes Publicos en los años de 1866–1870. *Presentada al Excmo sr Ministro de Fomento, por la direccion general de Agricultura, Industria y Comercio* [Statistics of the yield of Public Forests in 1866–70.] Madrid, 1882. 4to. pp. 160.

This is a continuation of a publication issued in 1866, and covering the period from 1861 to 1865. The present report is chiefly statistical, and of local interest. We may notice that the total receipts from the forests under the charge of government for the five years amounted to about $17,123,-680, and that the increase under the two principal divisions, in the years reported, was as follows:

	State Forests.	*Communal Forests.*
1865–6...........	$60,012	$1,492 389
1866–7...........	115,383	1,550,224
1867–8...........	69,865	1,718,824
1868–9...........	228,482	2,538,592
1869–70..........	170,269	2,056,630

Der Wald und die Alpen. Von El. Landolt, *Oberforstmeister und Professor in Zurich.* [The Forests and the Alps.] Zurich, 1881. 8vo. pp. 39.

Suggestions regarding the Management of the Leased Forests of Busáhir in the Sutlej Valley of the Punjaub. By D. Brandis, F. R. S., C. J. E., Inspector-General of Forests to the Government of India. Simla, 1881. Folio, pp. 26.

Elements of Sylviculture; a short Treatise on the Cultivation of the Oak and other Hardwood Trees. By the late G. Bagneris, *Inspector of Forests, Professor at the Forest School of Nancy. Translated from the French,* (2d Ed.) By E. E. Fernandez, and A. Smythies, *B. A. Indian Forest Service.* 12mo. pp. 283. *London. Wm. Rider & Son,* 1882. R. Clarke & Co., Cincinnati. $2.00.

The first French edition of this work appeared in 1873, and was published in India, in English, by the Forest Administration of the Northwest Provinces, the translation being by the same persons as those of the edition now noticed. The second French edition appeared in 1878, considerably enlarged.

The author, Gustave Constant-uictor Bagneris, was born at Douai, France, April 18, 1825; entered the School of Forestry at Nancy in 1844, and after several years of practical service, entered the school again as an instructor in January, 1858, where he remained until his death, about the middle of November, 1881. The manual under notice contains a concise statement of the leading principles of Sylviculture as taught in France. Commencing with definitions, it presents a general outline of the various methods of planting and managing woodlands, a comparison of the advantages and profits of each, the treatment suitable for different species, rules for artificial replanting, and other matters of direct practical interest in Sylviculture. To those who wish information upon these subjects, as taught and practiced in Europe, we know of nothing more concise and useful than this manual.

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FEBRUARY, 1883.

SKETCH OF THE DEVELOPMENT OF THE FOREST POLICY OF GERMANY.*

By BERNHARD E. FERNOW, of Slatington, Pa.

IT is a recognized fact in science, that the study of the development of certain processes breeds progress and further development. The same observation is true in political economy; and though it may be urged that conditions and needs in the various bodies politic are so different as not to admit of analogies, yet the knowledge of the history of development in certain departments, of measures adopted, reasons for their disuse, etc., will often, even under widely different conditions, serve as a guide to avoid the dangers of untried roads and wrong finger-posts.

The early settlers of this country may well be pardoned, if, in considering the objects to be sought after in their new home, the preservation of the forests should have failed to suggest itself to their minds, even for an instant. The most far-seeing of them could hardly be pictured, even by the most imaginative of poets, as mourning over the threatened destruction of the apparently interminable woodlands by which he found himself surrounded. Few, indeed, are the events that have happened, few the discoveries that have been made, in this greatly favored land, which, if we may credit the poets, have not appeared to the vision of some Pilgrim Father or other, as he sat, with his hoary head bent upon his staff, beneath the spreading oak that sheltered his door-way; but that a meeting should ever be held in the pathless, trackless West for the purpose of preserving the forests, may well be supposed to have been one of those few events *not* presented to his prophetic mind.

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* Read before the American Forestry Congress, at Cincinnati, in April last.

And yet, even at that early period, a nation across the ocean, once surrounded by forests apparently as boundless as those of the New World, was earnestly considering and legislating upon this very subject. The history of the development of forestal science in other countries, where it has for a long time held its recognized place among the other objects of human study and pursuit, can hardly fail to be of interest and value to all who endeavor to introduce and cultivate that same science here. I have, therefore, endeavored, in the following paper, to give as brief a sketch as is compatible with the breadth of the subject, of the development and progress of forest politics in Germany.

As in all other branches of political economy, we of the old countries have, from small beginnings, slowly developed what you, when the need comes, are bound to *create.* The peculiar difference in property-rights in old German times from those that were recognized at the time which marks the era of American politics, has had no small influence on the different development in this direction, as in most others of an economic character, in the two countries.

While you settled an immense country, almost peaceably, with a comparatively small number of people, under already clearly-developed rights of private property, Germany was settled by warriors, who had to keep together in order to resist enemies and conquerors on every side, ready to move and change domiciles at any moment. The soil which was conquered, consequently, was not divided, but owned as a whole, managed by and for the whole tribe. It is only in the sixth century that signs of private property in woodlands are discernible. There was not much need for partition, especially of the forests. Though naturally, in such a communistic property, not much extensive husbandry could be expected; yet there is no doubt that, even in Charlemagne's time, at-

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tempts were made toward securing the proper use of the woodlands.

From Charlemagne's time on, when the need of timber by the increasing population and the necessity of clearing for agricultural purposes were felt, the expediency of a more regulated management of the forests was recognized. During the same period a change in the idea of property rights was continually going on. Characteristic of this time is the erection of so-called "bau-forests" (in which the sovereign reserves certain rights for himself), the growing power of small princes, and the extension of private property, causes which were undermining the old institutions of the "Mark," in which all the land of a district belonged to, and was managed by and for, the aggregate of the society—a communistic institution of the most express character. Originally every "marker," or shareholder, was allowed to get the timber needed by him for his own use, without control.

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Since the fifteenth or sixteenth centuries, however, the timber to be cut was specially designated by the officials, whose duty it was to superintend the felling, removing, and even using of the same. By and by, even the fire-wood was designated by the officials. Grazing in the woods was still allowed, yet only under certain regulations as to districts and number of cattle for every marker. The manufacturers using wood received their raw material free of charge, yet only as much as they needed for the wants of the society or community. Each man had to plant, under supervision of the appointed forester, a number of trees in proportion to his consumption. The arbor-day of Kansas may be considered as a reminiscence of the old rules of the Mark. You see that there were some sound principles ruling in the use of the woodland in Germany even as early as four hundred to five hundred years ago.

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The introduction of the principles of Roman law, the interference of the liege-lords, the necessity of a management more in congruity with the more complicated demands of a higher civilization, were working on the downfall of the institution of the Mark.*

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* It is remarkable that the idea of a communistic ownership in forests has held its sway in Germany, even into our own time. I do not allude

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According to the Roman law, the right to the chase was a regal prerogative, which right might be conferred by the sovereign upon his followers. Though at first in the forests, in which the regal right was asserted (so-called bau-forests), the owner of the "bau-right" could not debar those entitled to the forest from the use of the timber, and could not make regulations in regard to the management without their authorization, very soon the needs of the chase gave use to restrictions in the use of the forest, and, by degrees, the former holders were reduced to the holders of servitudes—*i. e.*, holders of certain rights in the substance of the forests. Thus the chase came into the foreground, and formed the leading motive in the administration of the forest in this period.

Mining and furnace operations, salt works, etc., which in this period began to grow to larger dimensions, had, in some places, induced a more careful and economical use of the wood-supply. At the same time the development of cities, the improvements in the means of communication, increased trade facilities, and extensive demand for timber were working in the same direction, aided by police regulations which consisted mainly in the restriction of pasturage, interdiction of raking the leaves with iron rakes, prohibition of cutting grass in the young growths, orders to remove all the wood bought within a specified time, etc.

right to the

The doctrine of the regal right to the chase, in many cases, was the origin of a gradual annexation by the sovereigns of the whole right of *property* in the forests. By and by, this annexation was *justified* as a regal right of itself. And though we, at the present time, do not recognize such rights, yet we can not help, in some degree, agreeing with the principle upon which the justification of such right was founded by Justi in 1750, classifying, as he does, as regal rights those rights which are acceded to the highest authority over all goods and things which, not fit for private ownership, yet form part of the property of the commonwealth, in order that the same may be used in accordance with the demands of the

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here to the common belief of country people in their right to the adjacent wood, but to the fact that more than fifty per cent of the German forests is not private property, and that of this amount one-half is owned by communities of cities or villages.

common weal, and for the yield of revenues. From this definition he deduced the regal right to forests, since forestry demands such extended periods of time for the accomplishment of its aims as do not coincide with the objects of private economies. Yet other writers of that early period were democratic enough to confine this regal right to the sovereign's right of decreeing and enforcing forest ordinances. The legion of forest ordinances, then, of the fifteenth and sixteenth centuries were the outflow of the doctrine of the regal right. They aimed specially at the conservation of forests and improvement of forest management. They abound in detailed and technical precepts. At first treating the private interest with some consideration, they abandon more and more this mildness, and increase more and more the restrictions of free management. The aim of the government *then* was believed to be better served by direct interdicts and commands, while the essential point of modern government activity lies more in measures of an indirect nature—in the furtherance of educational institutions, the gathering of statistical knowledge, etc. As reasons for such interference on the part of the government, the ordinances presented the importance of the forests, the necessity of providing for the interests of posterity, the prevention of a timber scarcity and famine prices. The duty was also urged on the proprietor of husbanding his resources for time of need. The measures provided for the accomplishment of these objects were: Prohibition of absolute clearing, or, at least, only with the permission of the government; the command to reforest cleared and waste places, to foster the young growth, and the limitation of the quantity of timber to be felled. Above all, it was sought to prevent the devastation of forests by prohibiting the pasturing of cattle in the young growths, the raking and removing of the fallen leaves, pitch-gathering, etc.

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It would be of interest to define what is or may be meant by forest-devastation. The definitions given by writers on this subject vary according to the prevalence of different views regarding the place of forests in the political household. That which forms the principle of government activity at present may be expressed thus: Every action of the proprietor of a forest, which tends to disturb *lastingly* the foundations of

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a rational forest management is a forest-devastation, unless the same is done with a view to a change into some other system of husbandry.

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We often find in the ordinances more positive and special instructions for the management—prescribing the manner of felling, division into felling-lots, establishment of the direction in which to proceed with the cutting, time of felling, injunctions as to the cording and the removal of fire-wood from the lots, determination what is to be cut for fire-wood and what is to be held for building timber. The partition of forests was sometimes forbidden, and special officers appointed for the supervision of private forests.

lations for

Almost all ordinances contain provisions limiting the sale of forest products and forest soil, and especially prohibitions against exportation of lumber and sale of woodland to foreigners, against speculation in timber, by providing schedules of prices, and prohibition of the sale of some valuable species entirely from time to time.

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Further, even the *consumer* was restricted. Saving of building timber was attempted by allowing the building of houses only under State supervision, making provisions about the manner of building, the kinds and sizes of timber to be used. The erection and use of hearths and bake-ovens even was superintended, and the use of substitutes for wood, such as peat, coal, etc., was urged by freeing the latter from all tariff taxes. Manufactures which used much wood were sometimes limited or entirely interdicted. In all cases, the inferior class of timber was to be used first, before the better kind could be attacked, and superveillance reached even so far as to see that the consumer used the timber for the purpose for which he bought it.

We smile at the pedantic carefulness which, with paternal intentions, our governments bestowed on this subject. We may ridicule these mistaken attempts to influence the natural development of a branch of political economy, and to lead it into strict doctrinal channels; yet we have all reason to be thankful that the spirit of our ancestors was not quite so revolutionary as that of a later period, and that their conservative, restrictive policy has enabled us to exercise our superior wisdom on an object which they have preserved for us.

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When in the first half of the seventeenth century the legal, juristical nature of domanial property was more or less decided, when through the identification of the absolute monarch with the idea of State and Government, the accumulated landed property of the sovereigns became State property, the question of the advisability of maintaining these State forests in the hands of the government began to be agitated in forest political discussions, and has till a late hour been a subject of controversy with statesmen and economists. The basis on which the administration of the forest by the government was found desirable, has its origin in the same mercantilistic principles which made a supervision of private forestry appear necessary. The reasons which are given for the retention of State forests in the hands of the government, and for the purchase of additional forests, which are given, up to our own times, are either such as rest on true or imagined peculiarities of forest-management, such as emanate from sound principles of financial administration, and, thirdly, other reasons of general political consideration. Premising that it was in the interest of the community to perpetually produce the greatest mass of wood on the smallest possible area, and to sell this to the consumer at the lowest possible price, considering it the duty of the government to provide for the continual and sure supply of the needed timber, the following conclusions were drawn:

Conclusi

1. That the private forest management was insufficient for the fulfilling of the afore-named demands.
2. That the State alone is able to manage the forests in the manner which is required for the common weal.

In the first place, it was argued that the private individual lacked as well the knowledge as the means necessary for a successful forestry; large capital being required for the management, and that he would experience difficulties in disposing of his products. The tendencies of private husbandry, it was said, were in contradiction with the aims and ends of forestry, since the revenue from well-managed forests returned so late that new plantations did not offer any profit to the private individual, and it was natural for him that he should advance his own good before that of posterity. Investments in forestry did not pay as high a per cent of interest as other business; the private man, therefore, especially when prices rose, would be inclined to shorten the time of rotation, which tended to an uneconomical squandering of soil, as the demand for timber would have to be any how met, and with shorter rotation would have to be supplied from a larger area. Since thus the financial tendencies of the private man were continually in disconcert with the perpetuity and the demands of the common weal, it was to be feared that in cheap times he would cut too little; in dear times he would encroach too much upon the normal reserves. The private man would be inclined to export wood, if he could thus get a higher price for his material, even to the detriment of his country. Forest-management, it was said, was possible only on a large scale, and as soon as partition among private individuals took place, no measures would be efficient to restrain the wanton destruction of wood-supply. The private individual is not capable of surveying the whole demand of a country, and to so manage his forests as to meet the demands of future times. The private man, if he meant to produce good results in his management, could not dispense with the employment of officials just the same as the government; but such bureaucratic management offered greater drawbacks with the private man than with the government, which on account of its organic system in the different departments of administration, could also do with fewer officials.

Besides, the many dangers to which a forest is exposed do not make forestry a desirable field of speculation, which is the mainspring of all private operations; experience, any how, had shown that private forests were not managed as well as the State forests.

(To be continued.)

ON THE DISTRIBUTION OF THE MORE IMPORTANT FOREST TREES IN THE GULF REGION.

By CHARLES MOHR, Mobile, Ala.

(Continued from page 184.)

LARGE tracts of woodland, occupied almost entirely of White Oak, are found in Northwestern Louisiana, in the rich, loamy uplands between the Washita and Upper Red

River Valley, and also bordering on the southern tributaries of the Red River, along Bayou Boeuf and the valley of the Cane River. Many of the loamy ridges in the region of the mixed growth of the Loblolly-Pine with deciduous trees, are covered with the finest quality of White-Oak timber, nearly as far south as Houston, Tex. It is exceedingly variable in the form and size of its leaves and its fruit; a form with large, long and broad widely-lobed leaves and a large acorn, with a deep, thin-walled cup, principally prevails in Western Louisiana and Eastern Texas. Like the Basket-Oak, it is but sparingly reproduced, being but rarely seen among the undergrowth; and after its removal, it is mostly superseded by Oaks of inferior timber, such as the Red, Black and Spanish Oaks. It is consequently becoming scarce in the more densely-settled districts.

From the wide application of its valuable timber in constructions of all kinds, in ship-building, cabinet-making, cooperage, the manufacture of wagons and various implements, causing an immense consumption, its timber is becoming at present scarce, in localities, where a few decades ago, the supply seemed ample for a much longer period, and its exhaustion throughout the Northwestern States causes much apprehension to those concerned. There is no doubt but that, if it were secured against fire and the inroads of live-stock, it could be plentifully reproduced. The destruction of the humus by fires, and the exposure of its roots near the soil to the hot sun, retard its further growth, and lead to its early decay.

6. Post Oak, (*Q. stellata*). No tree in Eastern North America is distributed over a wider area than this Oak. It is found equally common from New England to the Gulf, and westward to the very confines of tree-growth in the arid ridges in Western Texas, where it occurs on the extreme outpost of the great forest region of the eastern division of the continent, in Concho and Maynard counties in that State. It prefers a dry, argillaceous soil, and is the most common among the upland Oaks. It forms open woods in the level uplands of Central Alabama and Mississippi, and forms a large part of the forest-growth of the more broken uplands in these States, as well as in Northwestern Louisiana and in Texas. In the

western part of that State, in the gravelly ridges which intersect the prairie region from its northern boundaries to its lower sections, it forms the open timber-belts, known as the "Southern cross-timbers." Under an arid climate, and from injuries received in frequent prairie fires, it can scarcely be used for any thing else than for low posts; but it is of great importance to settlers in the adjacent prairies as their only source of firewood. The value of these Post-Oak belts as sheltering screens against the fierce northers prevailing in these regions, can not be overrated. The wood of this tree is hard and heavy, strong and durable, but it is rarely over 50 or 60 feet in height, with a diameter of 16 to 20 inches, and it branches low. Clear sticks of timber can not be obtained of size large enough to make it available for building purposes. It is used extensively for posts, cross-ties, etc.

7. TAN-BARK OAK: CHESTNUT OR MOUNTAIN OAK, (*Q. prinos*). This tree occurs more commonly in the mountains of Northern Alabama, and has not been observed below 33° N. lat., where it frequents there the rocky ridges and steep declivities unfit for cultivation. The tree averages from 18 to 24 inches in diameter, and 70 to 80 feet in height, although trees are found with a diameter of four feet. The wood is heavy and strong, but more porous, and of a coarser grain and of less value than the White-Oak. Its chief value is in its bark, which is considered the best of all the Oak barks for tanning. Large quantities are shipped from Northern Alabama to the markets of the Northwest, amounting annually to over 12,000 cords. The destruction of trees from this cause is very great, not only in the indiscriminate cutting down of the trees, wherever found accessible, but in the vast amount of fuel; added to this, forest fires, increasing their destruction to a degree that not only involves the total ruin of the trees left standing, but prevents the possibility of a forest growth again appearing upon the denuded and arid rocky ridges from which it has been destroyed.

The invasion and partial destruction of large tracts of forest on the lands of the Government, near the railroad lines through the mountains of Northern Alabama, has been very extensive, and the supplies of bark are getting rapidly exhausted from the constantly increasing demand and higher prices. At several of the stations where a few years ago large quantities were received for shipment, the traffic has now almost entirely ceased.

8. Mossy Over-Cup Oak: Burr Oak, (*Q. macrocarpa*). This northern Oak is very rare in the eastern Gulf Region; its existence there is only known to me by a few acorns which have been sent from Callahan county. I have also failed to find it in Western and Northern Louisiana, where it has been recorded by Carpenter and Hale as of not rare occurrence. I meet the tree first at the very confines of the Gulf Region, near Palestine, on the banks of a tributary of the Trinity River. From hence westward to the San Saba, it is one of the most common trees in the fringe of forest lining the rivers. It reaches there as far south as latitude 29°, on the eastern terminus of Matagorda Bay.

9. Texas White Oak, (*Q. Durandii*). This species, in connection with the Burr-Oak, must also be claimed as occurring in the Eastern Gulf Region, in the same situations as in Western Texas, having been first discovered in Wilcox county, Alabama, by Prof. Buckley, in 1840. It was not again seen by any observer in Alabama, or any-where else east of the Colorado River until late in the autumn of 1882. The writer again found it on the calcareous ridges bordering the Little Cahaba River, in Bibb county, Alabama, and according to information, it occurs throughout the limestone region in other parts of that State.*

In the fertile bottoms of that river and the lower Guadaloupe, it grows to a large tree, and its timber is equal to the best of the White Oaks, being the most valuable of all the timber trees of the Texan or Mexican forest region. Several stumps were found, from 30 to 34 inches across, and one tree which had been felled for fence-rails, measured 96 feet in height, with a trunk clear of branches to the height of 40 feet. The distinct and constant characters of the foliage and fruit of this tree leave no doubt about its being a well-defined species.

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* Dr. Mohr, in a letter dated December 7, 1882, expresses great satisfaction at the re-discovery of this tree in Alabama, as it vindicated the correctness of the announcement made some forty years ago by his friend, Prof. Buckley, which had been doubted by some botanists. He had accepted the fact himself without questioning its accuracy, although he had never been able to find the species in any of his explorations, until his recent trip to the Little Cahaba River, from which, at the time of writing, he had but just returned. We have somewhat modified the text, so as to place the description there, although the facts were not known when the paper was written.—*Editor.*

10. UPLAND WILLOW-OAK: BLUE JACK, (*Q. cinerea*). This is one of the most common of the Oaks in the sandy barrens of the Coast Pine belt of the Eastern Gulf States, and one of the most common trees on the poor gravelly Oak ridges in Eastern Texas, westward to the Brazos River. It has not been seen north of 34° latitude.

11. SHINGLE OAK, (*Q. imbricaria*). This tree is common in the forests of the North, and seems to reach its southern limits but a short distance below the northern boundary of the Gulf States. It has been observed only in a single locality as a straggler of stunted growth in Etowah county, Alabama.

Of the Black and Red-Oak group, all the Eastern North American forms recognized as species of undoubted character are found in the Gulf States, with the exception of *Quercus ilicifolia*. They are chiefly of northern range, and principally confined to its central and northern sections; it is only near its western limits, in Texas, that they are more common. The five following species may be said to be about equally distributed through the Gulf Region:

12. SPANISH OAK, (*Q. falcata*). This may be placed among the first, on account of its valuable timber as well as its bark. It is of frequent occurrence in the thin soils of the coast-plain east of the Mississippi, and reaches the dimensions of a tree of average size. In the bottoms of the upper Pine region, in the rich, loamy lands of the Mississippian Yazoo delta, and in Eastern Texas, it is one of the largest trees of the forest. Near its western limits, on the banks of the Brazos River, Prof. Buckley measured a tree over five feet in diameter, and others of equal size were observed on the banks of the Chikasaha, in Mississippi, and in other parts of that State, as well as in Northern Alabama. The wood is of finer grain, greater strength and more durability than that of the Red-Oak, and is valued and used in the railroad shops and shipyards of Mobile to a considerable extent. It is well adapted for cooperage, and formerly the exports of its staves to the wine coun-

tries of the old world were quite large. The bark of the Spanish Oak is in the lower part of the country used for tanning, and is deemed in quality next to the Mountain Oak. In the better class of lands of the lower Pine region it succeeds, associated with the Loblolly and Long-leaf Pines.

13. RED OAK, (*Q. rubra*). This Oak is found quite frequently in the forest of Upper Alabama and Mississippi in a cool, deep soil not subject to overflow, and it reaches a size as great as in its northern home. It is found not less frequently in Northern Louisiana and Eastern Texas. West of the Brazos the tree presents some slight but constant differences in its fruit and leaves, and must be regarded as a well-marked variety peculiar to Western Texas. East of the Mississippi River it extends to 30° lat.; the western form reaches fully two degrees further south.

From the abundance of better Oak timber, the Red Oak is not much valued, but if logs of large dimensions are received at the mills, they are rated as about the same in quality as the Spanish Oak. Its timber, at the South, appears to be less porous, and stronger than that grown in the North.

14. BLACK, OR YELLOW-BARK OAK, (*Q. tinctoria.*) The southern limits of this tree follow in the eastern Gulf Region, the northern border of the maritime pine region scarcely reaching beyond the 32° of latitude. Westward it is found to the valley of the Trinity River. Fine specimens have been observed near Palestine. It prefers the uplands, with a light and warm generous soil, where it forms the principal tree, upon the gently broken uplands of Central Alabama. Its bark is used for tanning and its timber regarded as the strongest and most durable among the Oaks of its group.

15. WATER OAK, (*Q. aquatica.*) According to my own observation, this tree is not found beyond the northern border of the Gulf Region, but on the Atlantic border it extends far beyond the limits of the lower Southern States. It has not been seen beyond Waterford, in Mississippi, or Bridgeport, Alabama. If prefers a low, wet soil, is most common in the coast region, and generally of medium size, reaching over two feet in diameter. It is of no value whatever as a timber tree; but its very rapid growth, and fine outlines, render it a great favorite throughout the South as a shade tree. It is liable to the at-

tack of insects, leading to premature decay, and from this reason is less preferred than it otherwise would be.

16. **Black Jack**, (*Q. nigra*). This is the most common of the Oaks in poor porous soils throughout the whole region, and most common in the Pine districts, where barren and denuded of their primeval timber-growth. It follows the Post Oak to the extreme confines of tree-growth in the arid regions of Western Texas. It is of small growth, and its wood is coarse-grained, perishable, and of no value, except for fuel.

17. **Turkey Oak**, (*Q. Catesbaei.*) This is a typical southern tree in the Gulf Region and confined within the limits of the great maritime Pine belt east of the Mississippi River. It has not been observed north of 32° N. lat. It is the most common and often the only tree found on the arid ridges of pure white sand, where even the frugal Pine fails to find sustenance. With the Blue and Black Jack, it forms the largest part of the hardwood scrub which succeeds the Long leaf Pine, in the rolling Pine barrens. This harbinger of sterility rarely exceeds 35 feet in height, and is of no value.

18. **Chestnut**, (*Castanea vesca*, var. *Americana.*) This tree, widely distributed in the north, has been found as an isolated straggler as far south as the 31° of latitude, on the low ridges bordering the Tensaw, in Baldwin county, Alabama. On the hills of that region, in the mixed growth, it is not uncommon, but is rarely seen above medium size. From the numerous stumps found in the woods, and in the fields cleared over a half century ago, it is evident that the tree was there once found abundantly, and in its best development. It can be said to be almost extinct, in this region, at the present time.

It is most common in the mountainous part of Alabama, where, on the higher ridges and table-lands, it is one of the principal trees and is sometimes found from three and a-half to four feet in diameter. The trees of larger size, are rarely free from the signs of decay, and the older settlers contend that it is rapidly dying out. The chief cause of its decline, is undoubtedly from the destruction to which it is subjected by the settlers. Trees of the finest proportions are ruthlessly cut down for their fruit, and the demand for its timber for fencing has also led to its extinction near the settlements. The stumps produce an abundance of quick-growing sprouts, and coppices of vigorous growth would rapidly be reproduced on the rocky heights, if they were not destroyed by forest fires. It is rarely met with in Northern Louisiana, and so far has not been recorded from Eastern Texas.

19. CHINQUAPIN, (*Castanea pumila*). This tree is of smaller size in the Eastern Gulf States, where it is common throughout, but finds its greatest development in Eastern Texas, where it is not rarely found to reach 2 feet in diameter.

20. BEECH, (*Fagus ferruginea*). This species is scattered from Florida to Louisiana, in the hummock lands near the coast, and is often found a principal covering of the bottom lands in the upper Pine region. From hence northward, it forms woods of more or less extent in the cool stiff soils, best suitable to its growth. It has, to my knowledge, not been observed in Texas.

21. IRON WOOD, (*Ostrya Virginica*). This tree is common throughout the Eastern Gulf Region, but has not been observed by the writer west of the Mississippi. If found at all in Louisiana, it is certainly very rare.

22. HORNBEAM, (*Carpinus Americana*). This tree is common throughout the Gulf Region to the Trinity River in Texas.

Of the Birch only two species are found in the Gulf Region.

23. RIVER, OR RED BIRCH, (*Betula nigra*). This occurs on the Alabama River as far south as 31° latitude; more common and of larger size, on the river banks of Northern Alabama. Sections from Alabama in the collection of woods exhibited by the Louisville and Nashville Railway Co. measure 3 feet in diameter.

24. SWEET OR CHERRY BIRCH, (*Betula lenta*). This is confined solely to the cool and rocky recesses of the cliff-bordered valley of the Sipsey fork, in Winston county, Alabama, associated with the Hemlock Spruce. It has been observed over 80 feet in height, and 6 feet in circumference.

Of the Willows, which are very scantily represented in the Gulf region:

25. BLACK WILLOW, (*Salix nigra*). This is the only Willow reaching the height of a tree; it is common to the Lower Colorado in Texas, and attains a size from 1½ to 2 feet in diameter.

The Poplars are found represented by two species.

26. CAROLINA POPLAR, (*Populus monilifera*). This, among all the trees of Eastern North America, extends farthest to the west in the Texano-Mexican region, and can also be said to attain the largest dimensions. In the rich alluvions of the Mississippi River, and in the basin of the Yazoo in several localities, trees have been noted with a diameter of fully eight feet. By its abundance it furnishes, if not a durable, a cheap and easily obtainable material for fencing. Of late, it is used with advantage in the manufacture of cases for merchandise, of which already quantities are shipped from New Orleans to the West Indies.

27. (*Populus heterophylla*). This tree occurs .in the submerged swamps of Alabama and Mississippi, but appears to be unfrequent. It has been observed as far south as the lower Alabama, in Mobile county.

The Hickories and Walnuts with the Oaks, the most valuable and important trees of the North American forest, are well represented in the Gulf Region. With the exception of the *Carya sulcata*, all the species common in the North are found here equally common. Of the two typical southern species, viz., *C. myristicœformis*, and *C. aquatica*,· the former has not been observed in the Gulf Region.

28. SHELL-BARK OR SHAGGY-BARK HICKORY: SWITCH-BUD, (*Carya alba*). This Hickory finds its southern limits about 32° N. lat. Above that line, in the cool bottom-lands in the region of mixed growth, and in the richer lands throughout Upper Alabama and Mississippi it is quite abundant in the woods of deciduous-leafed trees. Westward, it has been but rarely observed in Louisiana, and it is said to be entirely wanting in Texas.

29. MOCKER-NUT: BIG-BUD HICKORY, (*Carya tomentosa*.) This is the most common species of the genus southward to the coast and as far west as Bastrop, in Western Texas. Except in Eastern Texas, where it is not frequent, it is abundant, and in the better class of lands of large size.

29. PIG-NUT, (*Carya porcina*), and, 30. BITTER-NUT HCKORY, (*C. amara*). These species are found from Florida to the Trinity River, but most abundant east of the Mississippi

River; southward they are confined to the same limit as the Shell-bark Hickory.

31. WATER HICKORY: BITTER PECAN, (*Carya aquatica*). This species is not rare on the banks of the large streams subject to frequent inundations in the Pine-region, almost to the coast; most frequent and of its best growth in the deep, gloomy forest-swamps on the Mississippi River, and the basin of the Yazoo, where a tree has been felled 20 inches in diameter. Also frequent in Louisiana and Eastern Texas. It has not been found beyond the northern borders of Alabama and Mississippi. The wood is close-grained and not inferior in toughness and capabilities to that of the Shell-bark Hickory, but being of a low growth, it furnishes no timber of a length to render it equally useful.

32. PECAN: SWEET PECAN, (*Carya olivaeformis*). This noble and useful tree is decidedly the tree of the Southwest. In the Eastern Gulf Region it is not known to have been found truly indigenous outside of the Mississippi bottom and the Yazoo delta, where trees were found to measure 5 feet in circumference. It is most common west of the Mississippi, and arises at its greatest perfection in the bottoms of the streams of Western Texas, below latitude 32°. On the banks of the Colorado, near Austin, trees with a circumference from 8 to 10½ feet have been measured. In its native home, it is of low and sturdy habit, with heavy wide-spreading limbs of a large ambitus. Its greatest height is estimated not to exceed 75 feet. Its fine flavored, sweet nut finds a great demand, and large quantities are exported from West Texas of a value reaching annually not less than $50,000 to $60,000. Large numbers of the finest trees were, during the sole reign of King Cotton, exterminated in devoting their terrain to the staple; but at the present it is carefully protected, as no crop will afford a more remunerative income than the fruit of the Pecan. It begins now to be extensively cultivated for its fruit in Louisiana and east of the Mississippi. It is, if well started after transplanting of the seedling, of vigorous growth. Trees planted three years old, by myself in 1872, are now 50 feet high, and 10 to 12 inches in diameter, having borne their first fruit four years after transplanting.

33. Black Walnut, (*Juglans nigra*). This tree is not rare in the upper part of the Gulf Region, and extends westward to the Nueces, in Western Texas. It can be regarded as truly indigenous in the lower part of the region east of the Mississippi. Near its western limit, it extends southward beyond 29° N. lat. In the rich valleys of Northern Alabama, and on the ridges of a warmer, deep loaming soil, in the Mississippi and Yazoo delta, this tree is found in full perfection. In Alabama, it is now becoming scarce; and fine tracts of many acres are now being destroyed in the districts last named, remote from transportation. It spreads rapidly southward, its seeds being carried down by the streams from the upper districts, giving rise to a second growth in the openings along their banks in the lower country, which, at an early age, produces an abundance of fruit. It is of rapid and easy growth, and in view of the great value of its timber, its cultivation can not be too strongly recommended.

34. Butternut, (*Juglans cinerea*). This tree of decidedly northern distribution is only found a short distance within the northern borders of the Eastern Gulf States. In Alabama it has not been found beyond Winston county, and in Mississippi its most southern station has been noted at Holly Springs. Being of small size and rare, it is in the Gulf Region of no value as a source of timber.

This closes the list of the more important trees of the amentaceous orders. Of the other apetalous trees, the following may be mentioned as worthy of notice on account of their usefulness and abundance.

35. Sycamore, (*Plantanus occidentalis*). This occurs throughout the Gulf Region, but much reduced in size, in Western Texas.

36. Osage Orange: Bois d'Arc, (*Maclura durantiace*). Strictly speaking, this tree can scarcely be said to be indigenous in the Gulf Region, the trees found scattered in the bottoms of the streams ot Eastern Texas and Louisiana being most probably adventitious from the northwest, beyond its limits. Having been introduced and largely cultivated in former years in the Gulf States for hedges, it is now found widely spread, and already of dimensions which render it worthy of remark, as a new source of the most durable of all the woods

produced in this country —valuable for all purposes where toughness and durability, resistance of the weather, and wear and tear are required.

37. MULBERRY, (*Morus rubra*). This tree is common east and west of the Mississippi; but in the first rarely beyond 31° N. latitude. In the richer lands, with a deep damp soil, it is found from one and a half to two feet in diameter. Its timber is much esteemed, and in Western Texas is much employed for knees in the smaller coasting craft. It occurs as far south as the Lower Colorado beyond the 29° latitude.

Of the Elms, all are found in similar situations, as abundant and of the same perfection of growth, as in higher latitudes, in all parts of the Gulf Region, with the exception of *Ulmus racemosa.*

38. WHITE ELM, (*Ulmus Americana*). This tree is common from the coast and westward to the Colorado River.

39. RED, OR SLIPPERY ELM, (*Ulmus fulva*). This is rarely seen beyond the center of the Eastern Gulf States, and is not rare in Eastern Texas, to the banks of the Lower Colorado, near Matagorda.

39: [SMALL-LEAVED ELM], (*Ulmus alata*). This species is common in low wet woods in the Trinity River.

40. TEXAN ELM, (*Ulmus crassifolia*). This Elm is more common in Western Texas, beyond the limits of the Gulf Region proper, and has been reported by Dr. Hale, from Northwestern Louisiana. In its true home it is a tree of importance, found from eighty to ninety feet and over in height, and frequently over two feet in diameter.

41. SASSAFRAS, (*Sassafras officinale*). This tree which is common every-where, reaches in the rich lands of the central districts, particularly on the Mississippi and Yazoo rivers, the dimensions of a large tree. It is easily worked, of great endurance in water, and has been much esteemed for dug-outs by the Indians.

42. CATALPA, (*Catalpa bignonioides*). This species extends as far south as the lower Alabama, but has not been observed in Texas. It is of larger dimensions in the upper districts.

The Ashes—with the exception of *Fraxinus sambucifolia,* the Gulf Region produces all that are found northward.

43. WHITE ASH, (*Fraxinus Americana*). This tree is abun-

dant in the bottoms and the rich slopes flanking the valleys down to the coast region. Of its valuable timber north of the Ohio, now almost exhausted—large supplies are yet found in the Eastern Gulf States. It is found westward beyond the Trinity to the valley of the Navasota, and of a stunted growth in the valley of the Colorado in Texas.

44. GREEN Ash, (*Fraxinus viridis*). This is common in the low swampy woods of alluvial districts from Florida to Western Texas.

45. RED ASH, (*Fraxinus pubescens*). This has been observed in the eastern part of the Gulf Region, as far south as latitude as 33° on Indian Bayou, and of larger size, (over two feet in diameter) in the bottoms of the Tuscumbia River in Northern Mississippi.

46. SWAMP ASH [WATER ASH], (*Fraxinus platycarpa*). This is a tree of small size, found principally in the submerged forest-swamps of the lower alluvial regions, but has been observed as far north as Tupelo in Mississippi.

47. PERSIMMON, (*Diospyros Americana*). Common everywhere to the Trinity, and as a large sized timber-tree, in the deep forests of the Mississippi and Yazoo region. It is much valued for the strength and durability of its wood.

48. [CAROLINA SOUR-GUM], (*Nyssa Caroliniana*). This species is common in low swampy woods and shallow ponds, from the coast to the northern confines of Alabama and Mississippi; in Eastern Texas it was not observed beyond the Nechez River. It is common in Western Louisiana, and occurs nearly two feet in diameter, and of the greatest perfection in the maritime pine region.

49. *Nyssa capitata.* This is a tree of medium size, and has only been observed near the eastern boundary of the region on the banks of Home Creek, and of the Choctawhatchee River in Western Florida.

50. SOUR-GUM: TUPELO, (*Nyssa multiflora*). Not rare in the more elevated lands not subject to inundation, and on the richer slopes bordering upon the bottoms southward to the coast and west to the Brazos River. A tree of medium size.

51. LARGE TUPELO, (*Nyssa uniflora*). Common in the deep submerged alluvial forest-swamps, particularly in the coast regions, where it reaches dimensions rivaling its most fre-

quent associate—the mighty Cypress. Trees over 100 feet in height and from four to five feet in diameter, five to six feet above its base, spreading out in wide buttresses, are not rare in the Cypress swamps. Its white and soft wood finds only a restricted use for hollow ware, such as bowls and trays.

52. Dogwood, (*Cornus florida*). This tree occurs throughout the whole region, but less commonly near its western boundary. On the rich hillsides in Central Alabama and Mississippi, it reaches over a foot in diameter.

53. [Sweet-Gum], (*Liqudambar styraciflua*). This fine tree doubtless reaches its greatest development in the bottom lands of the central and northern Gulf Region. There it is common to find trees of a diameter of from two to three feet and sometimes over, and a height of 100 feet, and with a trunk clear to a height of 45 to 50 feet. When of such dimensions its wood is of reddish brown color. Very compact and heavy, fine grained, durable, easily worked, little liable to warp, and admits of a fine finish. These qualities, with its pleasing tint, especially adapt it for the manufacture of furniture, for which purpose it is scarcely inferior to any other hardwood timber. Truly immense resources of this highly valuable timber, are existing in the Eastern Gulf States. On account of its color it is there called "Red Gum," and regarded as vastly superior to the Sweet Gum of higher latitudes.

54. Honey-Locust, (*Gleditschia tricanthos*). This tree is found in every part of the Gulf Region, and generally as a large-sized tree on the banks of the Mississippi and in the Yazoo delta. Its very hard and durable wood, serves principally for blocks, wagon hubs, and other minor purposes where great strength and resistance to friction are required.

55. [Water-Locust], (*Gleditschia monosperma*). This species is of smaller size than the preceding. It is rare eastward, and only observed on the banks of the Chattahoochee River. It is more frequent west of the Mississippi in the low woods subject to submergence, and throughout Northern Louisiana to the Trinity and Brazos.

56. Black-Locust, (*Robinia pseudacacia*). This tree is not seen west of the Mississippi, and perhaps not any-where in the Gulf Region, as truly indigenous.

57. Sugar Maple, (*Acer saccharinum*). This tree is limited

to the region east of the Mississippi, where it is found as far south as latitude 32° in the region of mixed tree-growth. Its most southerly station is at Quitman, Miss. It forms fine groves in the mountains of Northern Alabama.

58. [BLACK SUGAR MAPLE], (*Acer saccharinum*, var. *nigrum*) is there more common, particularly in the mountain ranges north of the banks of the Tennessee River. It is a pretty tree of medium size, hardy, and of vigorous growth. It is much planted for its shade in the towns of Northern Alabama.

59. SILVER MAPLE: WHITE MAPLE, (*Acer dasycarpum*). This tree is not found west of the Mississippi River. It is confined to the upper parts of the Eastern Gulf States. Its southern limits in Alabama, have been ascertained to be on the banks of the Warrior River, near Tuscaloosa.

60. SWAMP MAPLE: RED MAPLE, (*Acer rubrum*). This tree is common throughout the whole of the Gulf States, but of largest size in the swampy bottoms of the fertile Mississippi and Yazoo delta so remarkable for its heavy tree-growth, where it is occasionally found 5 feet in diameter with a height of over 100 feet.

61. BOX ELDER, (*Negundo aceroides*). Common in the interior of the Gulf Region throughout Louisiana, Western Texas, as far south as Matagorda Bay. As it endures very well the prolonged droughts of the treeless Southwestern Regions, it is much planted for its shade in the towns of Western Texas.

62. SWEET BUCKEYE, (*Aesculus flava*). This has only been observed in the deep forests covering the highest ranges north of the Tennessee River in Alabama. One of the largest trees met was felled, and found with a diameter of 26 inches and an actual height of 81 feet from its base. Its light-colored wood is used for ceilings, wainscoating, and other inside work.

63. BUCKEYE, (*Aesculus glabra*). This tree is not rare on the rocky limestone hills of North Alabama, south to Walker county, in Alabama. Of low, sturdy stature, rarely over 60 feet high or over 16 inches in diameter. Of no value as a timber tree.

63. TI-TI, (*Cliftonia ligustrina*). Strictly confined to the coast, in the Gulf Region on the Atlantic border to the banks of the Savannah River. Not above the dimensions of a

smaller sized tree (largest specimens seen 12 inches in diameter and 45 feet in height), it deserves a notice as producing the hardest wood amongst the Eastern North American tree-growth and furnishing the best kind of fuel.

64. HOLLY, (*Ilex opaca*). Common in low swampy woods westward to the Trinity River. Of best size in the wet forests of Central Alabama and Mississippi, where not rarely it is seen over 50 feet high.

65. HERCULES' CLUB, (*Xanthoxylum Clavi-Hercules*). Principally found near the coast, from Florida to the western border of the Gulf Region. In Eastern Texas, in cool, rich bottom-lands, it arrives at the largest size, trees having been found near the Trinity River two feet in diameter. The fine grained yellow wood is remarkable for its strength and durability.

Of the Linden trees both species indigenous to North America are found in the Gulf Region.

66. COMMON BASSWOOD: LINDEN, (*Tilia Americana*). This tree is found southward 32° latitude (Clark county, Alabama), and is quite common throughout the interior.

67. WHITE BASSWOOD, (*Tilia heterophylla*). This is confined to the mountainous regions of Upper Alabama, where it is frequently met with.

The Magnolias, the most prominent among the forest trees of the South, and particularly common east of the Mississippi, find within the Gulf Region and the Southern Atlantic States, in the same latitudes, their greatest development.

68. BIG LAUREL: MAGNOLIA: BULL BAY, (*Magnolia grandiflora*). This is eminently a type of the flora of the lower South, and finds its northern limits in an almost straight line from the Atlantic border to Western Louisiana, near the latitude 32° 30′ In Eastern Texas it is scarcely found above 31°, and it occurs as far to the west as Houston. It is found of largest dimensions and most frequent in the cool moist hummock lands with a light soil of the maritime Pine Region, in a soil rich in vegetable matter. A tree felled in Mobile county measured 38 inches in diameter and 98 feet in height. Specimens of similar size are not rare.

69. HEART-LEAVED MAGNOLIA, (*Magnolia cordata*). The occurrence of this beautiful tree in the mountain woods of Northern Alabama is now fully confirmed.

70. Large-leaved Magnolia, (*M. macrophylla*). This tree is limited to the eastern division. Found as far south as the shores of Mobile Bay. On the fertile slopes and in the narrow valleys in the mountains of Alabama it reaches a height from 50 to 60 feet, with a diameter of from 12 to 14 inches. A prostrate trunk on the Sipsey Fork of the Warrior River measured 22 inches through.

71. Cucumber-Tree, (*M. acuminata*). This tree common in the Eastern Gulf States, particularly the northern and central parts, reaching in Alabama in situations favorable to its growth, as far south as 31° latitude (Stockton, Baldwin County.) Trees from 80 to 90 feet high and over two feet in diameter are not rare in the mountains.

72. White Bay: Sweet Bay, (*M. glauca*). This is one of the most common trees of the Pine wood, covering the Pine barren streams in the Coast Region, where, under the conditions for its development, it is not rare to find it 80 feet and over in height and 16 to 18 inches in diameter. It becomes rare and much reduced in size beyond the center of the States.

73, 74. *Magnolia Frazeri* and *M. umbrella*, the smallest of their kind, are found as far south as 33°, 32° latitude respectively, and are not worthy of further remarks.

75. Tulip-Tree: Yellow Poplar, (*Liriodendron tulipifera*). In the rich valleys of Northern Alabama, in a warm calcareous soil, this tree attains the full dimensions for which it is famous in the North, but in the lower parts of the Eastern Gulf States it does not attain its greatest size. As scattered along the coast, it is always of stunted growth, and below the Pine belt it is scarcely seen larger than a medium-size tree. West of the Mississippi it is very scarce, but it has been seen by the writer on the uplands of the northwestern part of Louisiana. In Texas it is entirely wanting.

PROFITABLE FOREST-TREE CULTURE.*

BY MR. C. E. THORNE, OF SPRINGFIELD, OHIO.

THE writer, after noticing that alarm as to future scarcity was often met by present low prices, and the reputed changes in climate from the clearing off of woodlands, by historical accounts of floods and drouths while the country was still covered with forests, and citing from Mr. Thomas Meehan's Report as Botanist to the Pennsylvania Board of Agriculture, giving an account of timber-growth in the Shenandoah Valley, and elsewhere, now covered with woodlands that were once devoid of trees, adds:

"These facts are not enumerated for the purpose of discouraging the forestry movement; on the contrary, no well-informed man can doubt that there is great need that we should curtail, in every possible manner, the wasteful destruction of our forests, and look to the providing of a fresh supply for future generations. But, as I said at the outset, few of us are unselfish enough to provide such a supply, unless we can hope to realize some benefit from it ourselves, and an intelligent understanding of the probable condition of the natural supply of the future will enable us the more certainly to so plant that both we and our children may reap the greatest possible reward.

As I read the signs of the times, therefore, I see little encouragement for the ordinary farmer to plant the slower growing and less valuable kinds of trees, except upon portions of the farm which would give little or no return at best, or for purposes of shelter and ornamentation. With these exceptions, such planting should be left to those who have money to invest at a low rate of interest.

There is, however, one variety of lumber which is a striking exception to the general statement that prices are no higher to-day than ten years ago, and that is Black Walnut. Men who have split great logs of this beautiful wood into fence rails, or, still worse, have helped to roll them into the log heap of the pioneer clearing, have lived to see it worth a hundred dollars per thousand feet as it stands in the forest! No other North American wood bears so high a price, while no other tree is more easily raised, and few others grow more rapidly. The Black Walnut loves a fertile soil; it begins bearing at an early age, and its nuts are a valuable article of trade, hence there is no forest-tree requiring a comparatively long period of growth which can be planted on the rich lands of the Middle and Western States with greater promise of profit. But the Black Walnut is chiefly valuable after it has attained a half century or more of growth; hence it must be planted far enough apart to permit the spread of its branches in later years, thus leaving a large part of the soil unoccupied during its earlier growth, and permitting the cultivation of some other crop around it; but no other crop can be so grown.

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* Extract from a paper read at the Montreal Meeting of the American Forestry Congress.

Next to the Black Walnut there is now a greater demand for a wood which shall be durable when exposed to alternations of moisture, as are fence-posts and railroad ties, than for any other, and this wood we have in the greatest perfection in the *Catalpa speciosa*, which is also one of the easiest grown and most rapidly growing of trees. Neither the Catalpa nor the Black Walnut have yet suffered materially from the depredations of insects; both endure our severest climatic changes; surely, if timber-culture can be made to pay at all, it will be with these trees.

I believe that the culture of these trees can be made more profitable than that of any other crops usually grown by farmers in proportion to the labor required, and, in support of that belief, I submit the following estimates, which are based upon actual experience in the culture of the trees named, and upon a number of statements from persons of unimpeachable integrity.*

Let us take an acre of good land, either naturally or artificially under-drained, pulverize it thoroughly, and mark it into rows 4 feet apart one way by 2 feet the other; now let us plant 42 Black Walnut seedlings of one summer's growth on this acre, in such manner that they shall stand 32 feet apart each way; next let us plant *Catalpa speciosa* 8 feet apart each way, in such manner that a Black Walnut shall occupy the place of a Catalpa, and let us fill the remaining spaces with Cottonwood or White Willow cuttings, if we be on the prairie or near a powder manufactory, or with Black Locust, if near large market gardens. One acre thus planted will contain, besides the 42 Black Walnuts, 640 Catalpas and 4,080 Cottonwood, Willows or Locusts, these being planted chiefly for nurse-trees, to cause the others to grow straight and tall; and to help to keep down the growth of grass and weeds of their shade.*

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* This scheme, it will be noticed, bears a considerable resemblance to the one proposed by Dr. A. Furnas in the paper read by him before the recent meeting of this Association at Cincinnati. It had, however, been prepared before hearing his paper, and its estimates have not been modified since.

For these reasons let one acre be cultivated; by this time the trees will have made such a growth that their shade will prevent the growth of most other vegetation. Up to this time the cost of one acre have been about as follows:

Plowing and planting	$10
4,762 seedling trees and cuttings	25
Three years' cultivation	15
Total	$50

At the end of the fifth season, probably sooner, we may begin removing the nurse-trees, taking out alternates, so as to leave the plantation 4 by 4 feet. The 2,000 poles thus removed should have a diameter of 2 to 4 inches, and a height of 15 to 20 feet, and should make at least one good bean-pole each, if they be Black Locust, or a good fencing strip 12 feet long if of Willow or Cottonwood. Such strips cut in the summer and piled will be found nearly or quite as durable as Pine boards, and the saplings should be worth, either for bean poles or fencing strips, two cents each clear of expenses of cutting and preparing, or $40 for the acre. By the end of the eighth season, or before, the remaining nurse-trees should be removed, and should have double the value of the first lot, or $80.

Our plantation now consists only of Catalpas and Black Walnuts. Between the tenth and twelfth years we should remove the alternate rows of Catalpas, or 340 trees, leaving the remainder of the plantation at distances of 8 by 16 feet, and consisting of the 42 Walnuts and 300 Catalpas. The 340 Catalpas thus removed should yield two fence posts each, or 700 to the acre, worth 20 cents each, clear of labor, the wood, obtained largely, paying that item. Between the fifteenth and eighteenth years we should take out the alternate Catalpas, 164 in number, leaving the plantation 16 by 16 feet, and from the trees thus removed should realize seven posts each, or 1,200 in all, worth $240. Between the twentieth and twenty-fifth years the remaining 120 Catalpas should be cut and should yield 12 posts each, or 1,500 in all, worth $300. Now let us sum up our receipts:

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* In a plantation of Catalpas alone, in which the trees were set 4 by 4 feet, it has been found that they do not crowd each other sufficiently, hence 2 by 4 is recommended here.

First cutting,	2,000	poles	$ 40
Second "	4,000	"	80
Third "	700	posts	140
Fourth "	1,200	"	240
Fifth "	1,500	"	300
Total income for twenty-five years			$800
Deduct expenses of planting and cultivating			50
Net income for twenty-five years			$750

Or an annual gross income of $25 to cover taxes and rental value of land. I say nothing about interest, because the interest on expenses has been fully balanced by that on receipts.

Our plantation now consists only of Black Walnuts; for fifteen years they should have been producing nuts, and they should now yield an annual crop of sufficient value, to say the least, to balance the rental value of the land; while the trees themselves will constantly increase in value, and will at any time be marketable at a price which will give a very fair return on the investment made. We will suppose, however, that a young man has planted them, and that they are allowed to stand until fifty years old. At this time they should have an average diameter, 4 feet from the ground, of 16 inches, which would represent a yield to the tree of 250 feet of lumber, or 10,000 feet per acre, with, at present prices, $1,000 in the log, or $40 per year for the first twenty-five years, or $20 per year for the whole period since they were planted, saying nothing of the value of the stumps, nor of the tops.

The data upon which the foregoing estimates are based are partly drawn from personal observations on the growth of trees; and partly from statements made by the following named persons:

Thus Catalpas and Black Locusts planted on the farm of the Ohio State University by the writer, and measured at the end of two seasons' growth (three years from the seed), by Prof. Wm. R. Lazenby, averaged 2½ inches in diameter and 7½ feet high for the Catalpas, and the same diameter and 15 feet high for the Locusts. Four Catalpas measured by me in Springfield, Ohio, average 18 inches in diameter. They are not more than forty years old, and are probably less. Mr. H. C. Raymond, of Council Bluffs, Iowa, states that in ten years' time Black Walnuts had attained a diameter of 5 inches and a height of 20 feet, and Catalpas a diameter of 6 inches and height of 25 feet. Gen. Foster states that Catalpas have attained a diameter of 3 to 5 inches in a growth of four years from seed, and of 15 to 16½ inches in a growth of twenty-two years, the respective heights being 10 to 12 feet, and 35 to 41 feet. Prof. W. J. Beal stated at the Cincinnati meeting of the Forestry Congress that Catalpas had attained a diameter of 16 to 24 inches in thirty-two or thirty-three years' growth, and that Black Walnuts, five years from the nut, were 16 feet high and 7½ to 8½ inches in circumference; and another speaker at the same meeting stated that a tract of level prairie land was entered in Missouri in 1846; by 1857 the settlement of the neighborhood had stopped the ravages of fire, and this tract was covered with a dense growth of forest trees, mainly Black Walnut, averaging the size of a man's finger; by 1871 these trees were large enough for railroad ties, and ten years later were 12 to 16 inches in diameter. This, it will be observed, is the natural growth of the forest, without any thinning or other care, and was accomplished within but little, if any, more than twenty years, a much more rapid rate of growth than that allowed for in the above estimates."

THE RELATION OF FORESTS TO AGRICULTURE.*

BY DR. A. G. HUMPHREYS, OF GALESBURG, ILL.

ALL animal life is directly sustained by the agricultural and horticultural productions of the earth. These products must be well distributed and in profuse abundance, in order to promote the health, happiness, prosperity, and longevity of man, and his useful animal friends. Human existence should be a blessing, and not a curse. If it requires all our powers of mind and body to acquire the necessary means for a mere animal life, our existence can not be attended with happiness, nor can there be any high attainments in civilization; while, if the real necessaries of life are easily and cheaply produced, so as to afford leisure for the cultivation of both body and mind, happiness and prosperity will be most certainly attained. With these conditions secured, human society rapidly attains civilization, the arts and sciences are largely cultivated, and life becomes the source of the highest pleasure.

The conditions necessary for successful agricultural pursuits become most interesting and important subjects of human inquiry. Every farmer has learned that the climate in some parts of the world is better adapted to agricultural products than others, and that there is a great difference in the productive qualities of different soils. But how to make all parts of the earth highly productive, or in some way useful to man, is a question more difficult to solve.

A deep, rich soil is one of the first essentials to successful agriculture. But there are other conditions quite as important—a sufficient and timely rainfall, general distribution and retention of moisture in the soil, and better protection from devastating winds and from injury by early and late frost.

These conditions can not be well and thoroughly secured without a considerable proportion of forest-growth distributed through cultivated districts.

Large forests on mountainous districts, or along streams of water, may favorably affect the plain below, even hundreds of miles distant, by gradually letting off its moisture during summer from the accumulated snow of winter. Yet small groves, at a few miles distance from each other, would add to the productiveness, and to the wealth, of even such a favored district. It is not simply the extent of the forest-area of a nation that would render it rich in wood-products, or secure its best agricultural resources; but a thorough and general distribution of forest growth in all parts of the country. Some parts of the United States have had too extensive tracts of timber, and required to be partially cut away, as well for agricultural resources as for the uses of the wood; while other parts are vast naked plains, and urgently need forest-clothing to secure its best agricultural interest and the production of wood.

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* **Presented at the Montreal meeting of the American Forestry Congress, in August, 1882.**

When our fathers first settled the eastern portion of the United States, they found vast areas of timber, some of which had to be cleared away ere any considerable agricultural and horticultural interests could be secured. The woodman's ax was the first sound of the civilization we have so rapidly attained. At first the timbers could not be used, as the colonies were weak, and their necessities few. The demand of our times for forest-products, for mechanical and chemical uses, did not exist; so they must be destroyed. Neither the beauty nor the antiquity of these grand forests could prevent their destruction to make way for the beginning of agriculture. But as soon as a sufficient agricultural interest was secured to sustain an active and industrious people, the forests began to be utilized in the construction of large cities, thriving towns and villages, scattered all along the Atlantic coast, and reaching out into the Middle, and even to the Western States. We well remember the clearing processes practiced by the early settlers. The trees were thickly felled together in rows, allowed to dry one season, and were then burned. Log-rolling and huge log bonfires followed, to finish clearing the ground. The deadening process was also resorted to; the dense shade being removed, the deadening soon became valuable pasture lands, and being constantly drawn upon for fuel, rails, posts, shingles, and lumber, in a few years it was ready for the plow.

Our fathers little dreamed that the time would ever come when those districts, once the pride of American forests, would become barren, and districts unproductive either of wood or of value for agricultural purposes. The destructive process has been carried on so long and so extensively, that such is the case in many of the Eastern and some of the Middle and South-eastern States, and soon will be along our northern border. Had there been a timely check on the destruction of our forests, by individuals holding it as woodland, or, if possible, by national and State government purchase, so as to preserve at least one-tenth of this area, the remainder being devoted to agricultural and horticultural products, districts now deserted and barren would be thickly settled, and the inhabitants enjoying all necessary resources of wealth.

The evidences are abundant that a successful agriculture depends on a judicious distribution of forests. Dr. Oswald, in a paper on "The Climatic Influences of Vegetation," written for the *Popular Science Monthly*, says: "All over Spain and Portugal, Southern Italy, Greece, Turkey, Asia Minor, Persia, in Western Afghanistan and throughout Western Africa, from Morocco to the valley of the Nile, the aridity of the soil makes the struggle for existence so hard that, to a vast majority of the inhabitants, life, from being a blessing, has been converted into a curse.

"Southern Spain, from Gibraltar to the head-waters of the Tagus, maintains now only about one-tenth of its former population, and Greece about one-twentieth. As late as A. D. 670, a good while after the rise of the Mohammedan power, the country now known as Tripoli, and distinct from Sahara only through the elevations of its mountains, was the seat of eighty-five Christian bishops, and had a population of 6,000,000, of which number three-fourths of one per cent are now left! . . . The rivers of some of these countries have shrunken to the size of their former tributaries, and from Gibraltar to Samarcand the annual rainfall has decreased till failure of crops has become a chronic complaint. And all this change is due to the insane destruction of forests. The great Caucasian Sylvian, that once adorned the birth-land of the white race from the western Pyrenees to the front hills of the Himalayas, has disappeared. Of the forest area of Italy and Spain in the days of the elder Pliny, about two acres in a hundred are left; in Greece hardly one."

He says again of our own country that: "The States of Ohio and Indiana, and the southern portion of Kentucky and Michigan, so recently a part of the great East-American forest, have even now a greater percentage of treeless area than Austria and the Northern German Empire, that have been settled and cultivated for upward of a thousand years."

He believes the central portions of these districts are unproductive from lack of moisture that was once supplied by the forests.

There seems to be no possible means of averting the calamities that have fallen upon the old world, and are now threatening us, except by replanting a portion of our lost forests, and devoting a portion of our great prairie States to forest-culture.

From the nature of our government, we can not expect very great aid from Congress nor from State Legislatures; so the great work must be mainly accomplished by the agriculturist. If this subject could be thoroughly discussed among the people, and presented to the consideration of every farmer in the nation, their general intelligence is such that they would readily see its pressing importance, and immediately begin to devote a portion of their land to forest-culture. The individual of to-day might not reap immediate good results, but he would know that he was laying a broad and sure foundation for the happiness, prosperity, and wealth of his children.

There is another question which demands the farmer's attention, the importance of which he can not fail to see, and that is the present urgent demand for forest-products. If fifty thousand acres of the best Wisconsin timber are cut annually to supply the Kansas and Nebraska market alone, and if one hundred and fifty thousand acres are cut in the United States annually to supply the demand for railway sleepers alone, and thousands of acres more to supply other wood industries, we shall soon suffer a wood-famine, unless millions of acres are soon planted to forests, if, indeed, we do not, at the same time, suffer the calamity of an agricultural famine.

This subject, so closely allied to all the material interests of the country, should demand the immediate attention of both the State and National Governments. Many of the eastern nations have, through legislative enactments, given special attention to forest-culture; and there are also important international efforts to secure the necessary forest-clothing of the earth.

The Congress of the United States should immediately establish a Forest Commission, to co-operate with a similar Commission from every State in the Union. The work of such Commission should be to inquire into all subjects connected with Forestry—as, the relation of Agriculture to Forestry; the effect of forests on climate, in the production of annual rainfall and the general distribution of moisture; the national demand for forest-products to supply the wood industries of the country, and how best to secure a general tree-planting all through the country.

If our government would begin this work at once, and every agriculturist and horticulturist who is already alive to its importance does his duty, ere another centennial America will again be noted for her grand and magnificent forests. And with our present resources, we shall be in possession of all the elements necessary to national wealth and prosperity, and all the conditions for rendering our teeming millions an industrious and happy people.

PLAN OF FOREST PLANTING FOR THE GREAT PLAINS OF NORTH AMERICA.*

By Mr. H. M. THOMPSON, Lake Preston, Dakota.

IN devising or advocating plans for forest planting on the Great Plains which will prove to be generally beneficial in ameliorating climate, due consideration must be given to the physical features and to the meteorological conditions.

These features and conditions may be briefly stated to be as follows:

The Great Plains extend from the southern limit of the Staked Plains in Texas northwardly about 20 degrees of latitude to the Saskatchewan River and Hudson's Bay, and from an irregular east line, commencing in Texas, running through the eastern part of the Indian Territory, Eastern Kansas, and Nebraska, Western Iowa, the "big woods" of Minnesota, and the Red River of the North; westwardly of this irregular eastern limit an average distance of about 10 degrees of longitude to the foot hills of the Rocky Mountains, and containing an area of about 950,000 square miles. If all this region possessed a propitious climate, and all the soil were susceptible of cultivation, the area is sufficient to make 3,800,000 farms of 160 acres each, and which, by the aid of a proper forest economy, may be made capable of supporting an agricultural and pastoral population of fifty millions.

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*Presented at the meeting of the American Forestry Congress at Montreal, in August last.

This vast region, with the exception of the Black Hills, the Des Coteaux, and a few isolated mountains, may be said to be a level or slightly undulating plateau, having an altitude of a few hundred feet in the eastern part to several thousand feet in the western portion above tide water.

The plateau is intersected by the Red River of the North flowing northwardly, and bisected by the Missouri, the Arkansas, the Red River of the South, and their affluents, which, with few exceptions, are of minor size, "being raging torrents to-day and dry water-courses to-morrow." The entire plateau is treeless, with the exception of narrow fringes of forests skirting the margin of the streams, the Coolees of the Des Coteaus, the Black Hills, the lakes, and the few isolated mountains occasionally dotting the plains.

The soil of the eastern and a portion of the southern districts seems to contain most, if not all, the chemical mineral constituents needed for the successful growth of agricultural products and for the native grasses, and also to afford an unlimited capacity for grazing innumerable flocks and herds. The soil of the central, the western, and the southwestern districts is more varied in its general characteristics, there being considerable areas of arable alternating with the alkali and sage brush bush-plains capable of sustaining a vigorous vegetation.

The winter climate of the eastern part of the Great Plains is subject to sudden changes of heat and cold, and with a dry atmosphere in the north, more or less humid in the south, with rain, hail, or snow, the snow being drifted by the changeable winds over an area of hundreds of miles in extent, there being no forests, and the vegetation being destroyed by autumn fires, there are no barriers presented to retard the velocity of the winds and obstruct the drifting snow, by this means of constant motion and attrition the flakes of snow become comminuated into minute particles. When the snow is in this condition, accompanied by a low temperature and violent winds, it fills the atmosphere so completely as to obstruct the vision. These terrific drifting snows are denominated "blizzards," and often prove destructive to man and beast.

The meteorological conditions prevailing in the summer are high temperature during the day, low temperature and heavy dews at night, constant winds, varying from the moderate velocity of zephyr breezes to tornadoes and cyclones, slight rainfalls or torrential floods, and occasionally hail storms, nearly all the summer storms being accompanied with electrical disturbances unusual in forest regions.

On the western portions of the Great Plains the atmospheric aridity is so great that no certain reliance can be placed upon the production of cereals and vegetables without irrigation.

The constant winds on the Great Plains moving over thousands of miles of space, with no great chains of mountains or forests to impede their progress, and with nothing but the diminutive native weeds and grasses to shield the earth's surface from the intense heat of the sun's rays, penetrating through an arid atmosphere, causes rapid evaporation of moisture from the soil, and is wafted by the winds to where Nature's forest garb, by means of its cooling atmospheric influence, lowers the temperature and enables Mother Earth to appropriate from the clouds formed in unforested climes the moisture required for the sustenance of the vegetation clinging to her bosom for support.

The soil of the Great Plains, containing all the organic and inorganic constituents requisite for a varied vegetation, is capable of supporting an immense agricultural and pastoral population, to grow surplus products to meet the requirements of the commercial, mining, and manufacturing population of other portions of the continent. In order to accomplish this result climatic conditions must be modified. The result can only be accomplished by the means of cultivated forests.

The extent of the forests to be effective must be commensurate with the vast area.

The forests must be planted in such form as will generally shield the earth's surface from the sun's rays, and afford the greatest possible general resistance to surface winds and harbor insectivorous birds; provide for the constant and equal distribution of electrical currents; provide for equalizing temperature and moisture; prevention of the rapid flow of surface water; provision for the retention of snow, and the prevention of the drifting of the soil of cultivated areas.

As yet no general system of planting has been put in operation in this county, at least, to meet these requirements.

In the group form of planting generally in vogue, for the purpose of growing timber for economic use, there may be a manifestation of some beneficial climatic results. It is apprehended, however, that such form of planting can but otherwise result in sudden changes in temperature, and in such disturbance of electrical and atmospherical currents as tending to increased occurrences of tornadoes and cyclones, as instanced in the destructive effects of storms in Kansas, Nebraska, and Iowa, which seem to increase in frequency and destructive results in a ratio corresponding with the increase of the erection of habitations, other surface improvements, and the increased area and growth of the cultivated forests planted in the group form.

It must be concluded, therefore, that the shelter-belt system is the best form of forest planting for extensive plains. This form of planting has been advocated for many years in America. The principal, if not all the experiments in this direction, have been made by individual effort in isolated areas, and on a small scale, having usually been made one, or to the extent of a few rows of trees around buildings, stock yards, gardens, and in some instances around farms of considerable extent. These plantings have generally been made with the object of obtaining shelter only.

This system of planting on a more extensive scale, however, in which the shelter belts are to be planted with all the trees needed for economic use, as well as for the purpose of shelter, is, with the exception of the Des Coteaux, the Black Hills, and isolated mountains, applicable to the general topographical features and climatic requirements of the Great Plains.

These forest belts may be planted seven to ten rods wide around all sides of each 160 acre tract of land; or the shelter belts may be of less width, and the 160 acre tract subdivided by substituting inside belts of such width that the land planted may equal a fourth or a fifth of the whole area.

If, however, it be thought to be too great an undertaking, or the expense is beyond the means of the planter, the plantings may be commenced two or three rods wide upon the north and west sides of the land, and the plantings extended year by year, as the means of the planter will permit, until the maximum area is completed.

The first planting of trees may be profitably composed of such species as are indigenous to the locality, such as Box Elder, Cottonwood, Soft Maple, the Ashes, and the White and Golden Willow, European Alder, Catalpa, Locust, Butternut, Blackwalnut, Hickorynut, the Birches, Larch, hardy evergreens, and other species of trees as may be adapted to the soil and locality.

In after years, when these first planted trees become of sufficient size to afford shelter, other species of trees considered of doubtful adaptation, or too tender to endure the climate without protection, may be planted inside of the shelter-belts already established, and perhaps prove useful and remunerative to the planter.

If it be conceded that, all things considered, the shelter-belt form will accomplish the desired objects of retarding the increase of noxious insects; promote the increase of insectivorous birds, in modifying electrical conditions, in lessening the evaporation of moisture from the soil by evaporation, in retarding the velocity of surface winds, in cooling the earth and atmosphere in the summer, in raising the winter temperature, increasing the volume of atmospheric moisture, lessening the effects of cold northers in the South and blizzards in the North, lessening the liability of drifting soil and snow, and in mitigating the destructive effects of tornadoes and cyclones, in making the soil more uniformly productive, and thus make the Great Plains the grazing ground of countless flocks and herds, and become the grainery of the continent; then, and not until this result is accomplished, will our duties as citizens and our obligations to ourselves, to our country, and to untold millions of the human race yet unknown be fulfilled.

If this be true, then the establishment of a general shelter-belt system of forest planting for the Great Plains can not be inaugurated too soon.

Individual effort in this direction, without the encouragement of wise legislation on the part of the respective governments, will be isolated and the results too limited and too remote to be appreciably beneficial, hence the necessity of legislative action.

If history's teachings are true criteria, the wealth, power, and prosperity of nations largely depend upon a successful agriculture. But a permanently successful agriculture can not exist without the aid of a wise system of forest economy. A large part of the Great Plains is as yet public domain, and the respective governments can by enactment embody a system of forest planting as a condition of grant or sale, and, if need be, for the public good, may extend its requirements to lands owned by individuals and corporations.

It then seems to be the part of wisdom for the respective governments to inaugurate at an early day legislation providing for a general system of shelter-belt forest planting applicable to the Great Plains, with discretionary powers vested in a special Bureau of Forest Commissioners to make such modifications as might be required for the planting on the margins of lakes, streams, hill-sides, and mountain slopes.

And in furtherance of this plan it would undoubtedly be wise to make suitable provision in grants of land to the Territories when admitted as States by the Congress of the United States, and to the Provinces by the Dominion of Canada, for the purpose of establishing one or more experimental Forest Stations in each State and Province, under proper restrictions and conditions, with provisions requiring annual reports of experiments and observations to be made to the respective States and Provinces and to their respective general governments, and an interchange with and distribution to other nations and all Scientific Associations of a national character.

MEETING OF THE AMERICAN FORESTRY CONGRESS AT ST. PAUL IN AUGUST NEXT.

THE report of the Committee of the St. Paul Chamber of Commerce, to whom this subject was referred, comes to hand just as this number of the JOURNAL is going to press. We can only present portions of the report, but enough to show that the friends of Forestry are active and in earnest in their efforts to render the meeting a success. The chairman was authorized to appoint a committee of fifteen to carry their arrangements into effect. The report was presented by Mr. Leonard B. Hodges, and is signed by him and by David Day and E. J. Hodgson, the other members of the committee first appointed. After stating the objects of the Congress and names of its officers, the report says:

> By its constitution the officers of states, territories, provinces, or local Forestry associations, or the delegates of any government may participate in the proceedings of the Congress as honorary members.
>
> The rank and file is composed of scientists, practical tree-planters, and men of state and national reputation from nearly every state, territory, and province of the United States and British America.
>
> The papers read, and the accompanying debates by such a body of men as composed the Montreal meeting, embody an amount of information on Forestry hitherto unequaled and of the greatest practical and scientific value.
>
> At the Montreal meeting measures were taken for securing the attendance at future meetings of representative men from all sections of the continent.
>
> The committee of the American Forestry Congress having in charge the selection of the point for holding its next annual meeting have given St. Paul the preference; the reasons for which are its eligible location for such a meeting, and the interest that many of its prominent citizens and railroad companies have exhibited in promoting the cause of Forestry, whereby St. Paul has inadvertently achieved a national reputation in this behalf.
>
> It was also considered, by said committee, that, inasmuch as the American Association for the Advancement of Science would probably hold its next annual meeting at Minneapolis, at about the same time, that it would be expedient to hold the meetings of both associations convenient of access one to the other. * * * *

MISCELLANY.

A Mistaken Idea of Our American Forests.—In a friendly notice of this Journal in the number of "*Nature*" for November 23, 1882, our English cotemporary closes with this remark:

> "The forests in America are so extensive, and there is so much connected with them that belongs legitimately to the subject of Forestry, that we have no doubt the Journal will meet with a wide circulation."

To those acquainted with the settled portions of the Northern and Western States, where clearings have been going on without restraint and beyond reason, for periods ranging from twenty to one hundred and fifty years or more, and where the effects of denudation are beginning to be severely felt, this remark as to abundance can hardly apply. It can scarcely be said many years longer in any portion of the once heavily timbered regions of the North-west, from whence now come our principal supplies of White Pine,—nor of the Pacific Coast, in regions once renowned for their magnificent timber-growth, but where now, after scarcely more than twenty years of heavy operations, they are believed to be working on their last half.

In this view of the conditions that exist, we omit from our notice the vast treeless prairie and the plains where timber never grew within the knowledge of man, except in the feeble beginning made in recent years, that in many cases are but an indication of what might be done under careful and intelligent management. There are, indeed, considerable regions in the Southern States that might claim the term "extensive," in a certain sense; but they are none too great for the wants of the country in a not distant future, and their owners should not allow further waste of these resources, which, under prudent management,' would prove of great value.

When we see such States as *Michigan* and *Ohio*, through their Legislatures, encouraging the planting of trees by the appointment of an "Arbor Day," and the States of *Pennsylvania* and *Maine*, looking anxiously forward to the future, and inquiring, "What shall be done to restore our forest-supplies?" the indication is apparent that, in these States, once noted for the abundance of their forests, a realization of coming scarcity is beginning to be seriously felt.

Frauds in the Sale of Seeds of the Scotch Pine.—The seeds of the Scotch Pine are sometimes mixed with those of the Spruce-fir, being made to resemble them by dyeing black. The sure way of detection is to sprout a few by placing them in moist, rich soil, in a damp place. The Fir sends up a yellowish stem with eight or nine cotyledinous leaves, while the Pine has but five or six of these leaves, and a reddish stalk.

Mention of Forestry by Governor Hubbard of Minnesota.—In his Message at the opening of the present session of the Legislature, the Governor makes reference to the subject of Forestry as follows:

> "We are intelligently committed to the policy of encouraging Forestry. In that connection I commend the suggestion that the State assume the expense of printing a considerable edition of a revised manual of Instruction for Tree Culture, and for its free distribution to those who seek information.
>
> "The American Forestry Congress is expected to hold its next Meeting in St. Paul, in August. It will be an

occasion of great importance to our people. The use of the rooms of the Capitol are tendered, as far as may be serviceable, and it seems proper that the State Forestry Association be provided funds at least sufficient for the Manual referred to, and for their incidental expenses in connection with the expected Meeting."

The Manual above referred to was prepared by the Hon. Leonard B. Hodges, Secretary of the State Forestry Association. A second edition (6,000 copies) was issued in 1880, and another, revised and enlarged, is understood to be ready for publication. It is a valuable repository of facts and information, and can not fail to prove of great service to the tree-planters of that State; among whom it is intended for free distribution by the State Forestry Association.

In reference to the proposed Meeting at St. Paul, in August next, we are informed that the Chamber of Commerce of that city is taking measures towards securing facilities, and with the zeal and enterprise characteristic of the citizens of that place, we may confidently expect that their arrangements will be complete. We will seasonably announce these as soon as they are settled, and earnestly hope that the friends of Forestry, in the United States and Canada, will improve the opportunity of attending, and of participating in the proceedings.

The Radiation from Denuded Surfaces in Tropical Climates.—In places particularly liable to fires, clearings had been made, so as to leave the surface entirely bare. Its effect is thus described:

"Since fire-conservancy was commenced, a complete change appears to have taken place in the climate of Bairagarh reserve. Before the forests were protected, frosts were hardly ever heard of; now they are of annual occurrence, and unfortunately they are most severe in low lying lands and in blanks—the very places where plantations are formed. Year by year thousands of artificially raised plants are killed by frost, and there is no certainty that plants of this kind that have survived one year may not be killed the next. Thus, a plantation shown as fully stocked in one report may, on a future occasion, have to be entered as insufficiently stocked.

"It is only, however, in places completely denuded of timber growth that frosts are so destructive. Where there are a few trees, or even a little scrub jungle, frosts do comparatively little harm, and this would seem to point to the desirability of discontinuing the system hitherto in force, in clearing lands of grass and every description of growth prior to sowing or planting, and of only forming plantations in places where there is already some kind of vegetation."

Forest Trees Most Suitable for Streets, Lawns, and Groves.—Mr. J. Beaufort Hurlbert, LL.D., of Ottawa, in a paper applicable to considerable portions of Canada and to the Northern States, which was read at Montreal in the Meeting of August last, said:

"There are in Canada some seventy to seventy-five forest trees; and thirty to forty shrubs. Of these I would give the preference among the deciduous trees for streets and lawns to the Maples, Elms, Basswood, Beech, Birch, Oak, Butternut, Walnut, and Ash.

"For streets, the Maples are the chief favorites. They bear transplanting well, grow rapidly, make a good shade, and are hardy and clean.

"For broad, long streets, especially, the White Elms (*Ulmus Americana*) are beautiful trees, locking, in time, their branches over the broadest streets.

"For lawns and groves, the deciduous trees should be interspersed with the coniferæ and shrubs.

"To particularize, we have the following:

Acerinæ.

The Sugar Maple, (*Acer saccharinum*).
Soft Maple, (*A. rubrum*).
Striped Maple, (*A. Pennsylvanicum*).

Ulmaceæ.

White Elm, (*Ulmus Americana*).
Red Elm, (*U. fulva*).

Cupuliferæ.

White Oak, (*Quercus alba*).
Black Oak, (*Q. tinctoria*).
Red Oak, (*Q. rubra*).
White Beech, (*Fagus sylvestris*).
Red Beech, (*F. ferruginea*).

Betulaceæ.

Paper Birch, (*Betula papyracea*).
White Birch, (*B. alba*).
Yellow Birch, (*B. excelsa*).
Black Birch, (*B. lenta*).

Silicaceæ.

Hoary Willow, (*Salix candida*).
White Willow, (*S. alba*), introduced from Europe.
Aspen, (*Populus tremuloides*).

Tiliaceæ.

Basswood, Linden or lime, (*Tilia Americana*).

Pomeæ.

White Thorn, (*Crataegus punctata*).
Black Thorn, (*C. tomentosa*).
Cock Spur, (*C. crus-galli*).
Mountain Ash, (*Pyrus Americana*).

Cornaceæ.

Flowering Dog-wood, (*Cornus florida*).
Alternate-leaved, Cornel, or Dog-wood, (*C. alternifolia*).

Oleaceæ.

White Ash, (*Fraxinus Americana*).

Anacardiaceæ.

The Sumac, (*Rhus typhina*).

Coniferæ.

White Pine, (*Pinus strobus*).
Red Pine, (*P. resinosa*).
Yellow Pine, (*P. mitis*).
White Spruce, (*Picea alba*).
Black Spruce, (*P. nigra*)
Balsam Fir, (*Abies balsamea*).
Tamarac, Larch, or Hackmatac, (*Larix Americana*).
White Cedar, (*Thuja occidentalis*).

"For the western part of Ontario there are many fine trees for groves which do not thrive well as far east as Montreal or Ottawa, such as the Tulip tree (*Liriodendron tulipifera*) and Black Walnut, large forest trees west and south of the head of Lake Ontario. With these may be classed a still larger tree, and a magnificent one for lawns and pastures in the western part of Ontario, the Plane tree (*Plantanus occidentalis*); the Sassafras, Red Cedar, and Pepperidge (*Nyssa multiflora*).

"To this list of native trees might be added for groves and lawns many beautiful shrubs and vines."

The Effects of Improvident and Excessive Clearings were presented in a strikingly impressive manner, in a paper by Mr. J. Jenkins, of Winona, Columbiana county, Ohio, entitled "The Mills of West Fork," communicated at the Montreal Meeting of the American Forestry Congress. After locating the "West Fork" as a tributary of the Beaver River, a branch of the Ohio, he thus describes its present appearance:

"Looking down the valley, you may trace a stream winding like a silver thread through the green meadows, with here and there an unused mill—its great wheel standing motionless—that used to turn in the laughing foam and spray, in the once abundant flow of the waters of West Fork. Turning to the northward, where the diminished stream comes tumbling down between the abrupt hills, denuded and bare now, a visitor of twenty years back would scarcely recognize this as the same stream or the same valley that he then knew and loved. From the retired forest dells in that decade the feeding rills from many a bubbling spring joined

West Fork and poured their treasures of moisture into its receptive bosom.

"Now, since the trees have been cut off, many of these sources of supply have dried up. The trickling flow from others is evaporated before reaching the foot hills and this paltry stream alone is left instead of the broad acres of water in successive mill-dams that used to sleep, catching the sunshine and shadow between the wooded hills. . .

"Let us now consider what has been gained and what lost by the wholesale destruction of the woods at the sources of West Fork:

"We have gained to agriculture for pasturage and for cultivation, a large area of fertile land in the emptied basins of the old reservoirs and mill-dams. We have gained pastures and farming lands on the hills. We have gained in the aggregate productions of the region and in population by extending the cleared land.

"On the other hand we have subjected ourselves to cloud-bursts on the naked hills, which once drank in the descending floods in the porous woodland soil, but now the solid compact hill-sides throw off the floods into the valley at times an irresistible torrent, carrying destruction and death in its course. We have lost in the destruction of untold millions of feet of lumber, sold at prices low compared with present rates, with vast amounts of wood recklessly destroyed, and when we consider also the fact that as a result of our interference with the restorative operations of nature we have stamped out all prospect of the renewal of the forest-growths by close pasturing and continuous plowing, it is indeed a question whether we have not lost instead of having gained by the change.

"Not that we would regain all the land in woods again were it in our power; but by judicious replanting of the waste lands where the woods have been destroyed, the steep and rocky hill-sides and ravines that possess but little value for agriculture, we might establish the happy equilibrium, preserve and restore the springs and feeding rills of West Fork and prevent a further diminution of the stream.

"Are there not in our hill countries many 'West Forks,' where a judicious area and proportion of timber-planting and preservation by shading the springs and water-courses of the little rills that act as feeders, would enable us to utilize and render profitable, lands of little value for cultivation? Keep up the proper balance of woodland and tillage which preserves in a measure greater uniformity of climate, humidity, and rainfall, while all the time, and for all time, the land so appropriated and occupied will be yielding a rapidly increasing capital and a paying investment in the production of timber. . . .

"Looking again down the valley the evening shadows are clustering over the mills of West Fork.

"Those ruins of a past decade, are standing like sentinels in the twilight.

"The lowing cattle are winding their way in long lines from the old basins to the spacious barns. The diminished stream gurgles on, all unmindful of its former glory that passed away with the forest.

"We welcome the new decade and the conditions of advancing civilization, yet fear less a further destruction of the woods around the sources of West Fork, and continued neglect of their reproduction may erelong dry up the stream and the fertile valley become parched and desolate."

Rhus cotinoides.—This species is interesting from its rarity. It was first found by Nuttall in Arkansas, in 1819, and in April, 1841, it was found by Professor Buckley in Northern Alabama. From that time, it was lost to science, until September, 1881, when it was again found by Dr, Charles Mohr, of Mobile, Ala., in connection with his work on the tenth census. For this purpose he made several special trips to the valley of the Tennessee River in Madison county, Ala., and finally succeeded in finding it in nearly the same place where it had been seen by Professor Buckley forty years before. From an account prepared by Dr. Mohr, for the proceedings of the Academy of Natural Science in Philadelphia, June, 1881, we quote his description of the incident, as he arrived at the Baily farm, near the base of a bold mountain range, rising 900 to 1,000 feet above the Tennessee River:

"The sight of my botanizing capsule dimly recalled to the present owner the Professor's visit at his father's, but he had no conception of its objects. He informed me that there is a small tree found in abundance in the low foot-hills skirting the valley, yielding a yellow wood used in dyeing, which he considered to be the tree I was in search of; and as fine specimens could be obtained nearer by, the trouble of hauling them down the mountain could be avoided.

"Great was my disappointment when the *Rhamnus Carolinianus* was pointed out to me as the yellow wood. I felt quite relieved by the forthcoming statement that there was another kind of the yellow wood found on the rocky benches near the summit of the mountain, of which his father brought down a stick over thirty years ago, to serve on account of its strength and durability as a cross-piece to the rack used in his slaughtering-pen. On a closer examination it was found to be a kind of timber I had never seen before, and after an exposure for such a length of time, was perfectly solid, sound, and to all appearances as durable as ever. No time was lost now in looking for its source on the mountain. The lower flanks of the range, less steeply inclined, with a rich, deep soil, are almost entirely under cultivation; the steep incline above the clearings, with its rock-covered ground, supports a fine forest of Mountain Oaks, (*Quercus prinos*), Chesnuts, Black Ash, (*Fraxinus quadrangulata*), Elms (*Ulmus Americana*), Maples, (*Acer saccharinum*, var. *nigrum*), Mocker-Nuts, (*Carya tomentosa*), interspersed with coppices of Red Cedar, (*Juniperus Virginiana*), with a dense undergrowth of trees of a smaller size; Plums, (*Prunus Americana*), Black Haws, (*Viburnum prunifolium*), Hornbeam (*Carpinus Americana*), and various shrubs, (*Rhus aromatica*, *Forestiera ligustrina*), etc. The heavy outcrops of this mountain limestone form on the steep declivity extensive ledges, and terrace-like shelves traversed by shallow ravines—their fragments which cover the ground making the access to these woods quite difficult. It was upon this rocky soil, amongst its varied forest-vegetation, that the coveted object of my search was found growing. Not more than half a dozen trees of the same kind were found in this locality, scattered along one of the rocky ravines measuring from 25 to 35 feet in height. The largest one felled measured 35 feet in length, and 12 inches in diameter one foot above the ground.

"Arrived at such dimensions the tree has evidently long passed the best period of its life, judging from the decay by which more or less the trunk was found affected. No sign of a decline, however, could be observed in the vigor of its vegetation.

"The trunk divides at a height from 12 to 14 feet above its base, the primary limbs are erect, the secondary branches widely spreading, often slightly reclining, smooth and divide into numerous divaricate reddish branchlets, rugose from base of the leaf-stalks of the previous season. The bark is rough, covered with a whitish grey epidermis of a deep chestnut-brown underneath, and exfoliating in oblong square scales of uniform size. The inner bark is white, exposed to the air turning rapidly to a deep yellow color, and exudes when bruised a resinous sap of a heavy disagreeble terebinthinous odor. The wood is heavy, very compact, of a fine grain; the white sap wood of small proportion surrounds, as a narrow ring, the deep yellow hard wood, varigated by zones of different shades of brown, imparting to it a beautiful appearance when polished.* . . .

"The inner bark and wood are used in dyeing yellow, and it is said also, for the production of purple tints. On this point, however, no definite information could be obtained.

"Large numbers of trees were cut down during the war to procure a dye-stuff much valued at the time, and full-grown ones are now quite scarce near the settlements. On account of the beauty of its wood, the tree is called Shittim-wood by the negroes, they believing it to be the same which was used in the construction of the tabernacle in Solomon's Temple. The wood permits of the finest finish; the fineness of its grain, beauty of color, and its hardness, fit it well for inlaid work, veneering, and the manufacture of small articles of all kind of fancy woodwork. As an oramental tree it far surpasses the European species, and will be found quite as hardy."

In searching for flowering specimens in May, Dr. Mohr came upon extensive coppices on the Southern slope of Mount Sano, east of Huntsville, the second-growth from numerous stumps that had been cut for kindling-wood within the last half century. Its resinous wood burns easily with a bright flame, and this rare and interesting tree is constantly sacrificed for this purpose, where easy of access. It seeds sparingly, but grows readily from layers, and it is to be hoped that our enterprising nurserymen will not lose the opportunity of adding this to their list of trees under cultivation for ornament and use. It appears to demand a calcareous soil as it was never found on the sandstone cliffs but a short distance above the limestone strata, nor lower down where the soil was deep and rich. It is said to extend northward into Tennessee, following the flanks of the Cumberland Mountains, in their north-easterly trend.

Resolutions of the National Agricultural Convention at Chicago.—At the recent Meeting held at Montreal, this Convention adopted the following praiseworthy resolutions in behalf of Forestry:

"*Whereas*, We begin to realize the lamentable wasting of the Forest Lands in the United States, and the sad effects of their destruction upon the climate and water-supply of the country, and we are forced to confess our need of the knowledge of the better management of the woodland than is now possessed by the people; therefore,

"*Resolved*, That we urge upon the State Legislatures the propriety of selecting judicious persons to act as State Forestry Commissioners, whose duty it shall be to instruct the people in regard to forest trees and their production and management; said officers to report annually upon the condition of the woodland in their respective commonwealths.

"*Resolved*, That we beg of the Agricultural Colleges established under the land-grant of Congress, that they shall lose no time in planting State arboreta and establishing Forest Experimental Stations, where all species adapted to the soil and climate shall be tested, and whence surplus seeds and plants may be distributed. Annual reports of these establishments to be made to the Governors of the State Boards of Agriculture.

"*Resolved*, That Congress be asked to establish one or more Experimental Forest Stations upon the Public Domain, where the propagation and testing of useful trees shall be the leading object, with the collection of seeds and plants to be distributed by or under direction of the United States Agricultural Department, to which bureau these stations should make annual reports."

The above recommendations are wise, and deserve the thoughtful consideration of our legislators in every state of the Union. They cover in part the ground of the resolutions adopted by the American Association for the Advancement of Science as adopted at its session in Boston, in August, 1880, and transmitted to the Governors of the several States and Territories, with the request that they would lay them before their several Legislatures for their consideration. This memorial was delivered personally by the editor of this JOURNAL, who was chairman of the Committee reporting it, to about twenty of the Governors, and in some of the states it was transmitted with favorable recommendations. This Memorial and its recommendations are printed in the Proceedings of the Association above named, and in the Third Report upon Forestry published under the auspices of the Department of Agriculture; but as these may not have reached some of the readers of the JOURNAL, we here reproduce them.

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*A minute botanical description of the leaves, flowers, and fruit is here omitted.

Memorial of the American Association for the Advancement of Science, in relation to the Need of Attention to our Future Forest Supplies.—We would earnestly invite the attention of your Honorable Body, to the great and increasing importance of providing by adequate legislation, for the protection of the existing woodlands of the country against needless waste, and for the encouragement of measures tending to the more economical use, and the proper maintenance of our Timber Supply.

It is evident that the consumption and waste of the Forests of the country much exceed their restoration by natural growth, that the native supply of Timber of the better qualities is rapidly becoming less, and that the demand for building purposes, manufactures and other uses, is rapidly increasing from year to year.

This decreasing supply, and growing consumption, must unavoidably lead to serious inconvenience, and may, unless seasonably prevented, occasion great public injury, by leaving the future without adequate supplies.

We deem it an established fact, that the interests of Agriculture are promoted by the presence of a due proportion of woodlands in a country, and that they suffer when clearings are carried to excess. The protection which they afford appears to mitigate, in a sensible degree, the vicissitudes of climate, and to maintain the supply of water in springs, rivulets and wells. They shelter a country from injurious winds, and may be made practically useful in preventing the drifting of snows and sands, in preventing or diminishing damages from torrents, and in limiting unhealthy emanations from marshes. Their influence in connection with questions of water-supply for cities, and the maintenance of hydraulic power, and of navigation in rivers and canals, where these may be affected by droughts, deserves serious attention.

But it is especially to the woodlands, as a source for supplying materials of first necessity to the country, that we would respectfully invite the attention of your Honorable Body; and here we would remark, that a realizing sense of the importance of this subject has long since led the principal governments of Europe to enact laws, and establish regulations for the maintenance of a due proportion of Forests upon their Public Domains, and upon the lands belonging to Local Municipalities and Public Institutions.

We are aware that wide differences exist, in the tenure of land, in the United States, as compared with those of Europe, and that the titles to landed property are here very generally vested in their owners, without any condition whatever as to Timber Culture.

It is also true that, in most of the older, and in some of the newer Sates, there are no lands whatever, adapted to this use, now belonging to either the State or the Local Governments—the whole being owned by private citizens, and subject to no conditions, but such as their Representatives in a Legislative capacity may establish for the general welfare.

It is to the Owners of the Land, that we must therefore look for the adoption of measures tending to avert the injuries in prospect; and in furtherance of this end, we deem it within the province of a State Legislature to encourage the enterprise, which may be done in a good degree in the following manner:

1. *By a Law protecting Trees planted along the Highways, and by encouraging such plantations by deductions from Highway Taxes. It may, in particular cases, be proper to require such plantations to be made at the public expense, with the view of protecting roads from drifting snows, or for other local benefits, and in a manner best calculated for securing these objects.*

2. *By a Law that shall exempt from taxation the increased value of land, from the planting of trees, where none were growing, for such period as may appear proper, or until some profit may be realized from the plantation.*

3. *By the appropriation of money to Agricultural and Horticultural Societies, to be applied as premiums for tree-planting, regard being had to greatest areas planted, and the most successful management. Reports should be required, giving details of the methods found most effectual in obtaining these results.*

4. *By prizes for the best Essays and Reports upon subjects of practical Forest-culture, to be awarded by competent Judges, and those approved, to be published for distribution among those who would be the most benefited by this information.*

5. *By encouraging Educational Institutions within the State to introduce a course of instruction, having reference to practical sylviculture. This object may be promoted by the aid of Collections, and by correctly labeled Plantations of the various species of Forest Trees adapted to the soil and climate. At Agricultural Colleges, and at higher Institutions of Learning, stations might be advantageously established under State patronage, for experiments and observations in cultivation and acclimatization. The distribution of seeds and plants affords a direct and efficient aid, in the promotion of an interest in this subject.*

6. *By laws tending to prevent Forest-fires, by imposing penalties against the willful or careless setting of such fires, and by enlarging and defining the powers of Local Officers in calling for assistance, and in adopting measures for suppressing them. The waste from this cause, in some years, greatly exceeds the amount of timber used, and there is no question connected with forest supplies, that demands more serious attention. Our main reliance appears to depend upon vigilant precautions, enforced by adequate penalties, and sustained by a strong public sentiment.*

7. *Under favorable circumstances, Model Plantations might be established and maintained by a State Government, under the care of persons specially trained to the profession of Forestry. Their location should be chosen with a view of affording convenient opportunity to those who might wish to learn approved methods of management, by the study of a work worthy of imitation.*

8. *The appointment of a Commission of Forestry under State authority (analogous to the Commission of Fisheries in many of the States) might prove of great service in promoting efficient measures for the advancement of this interest. The Members of such a Commission, who would doubtless be selected on account of their influential standing, and their known intelligence upon this subject, would be able to study the conditions and requirements of their State, and devise means for most effectually securing the objeet in view.*

In the questions arising upon the subject, we depend much upon the intelligence of our fellow citizens, who are generally not slow to appreciate advantages, or to foresee a real danger where the indications are apparent. When this danger is fully realized, we believe that no time will be lost in seeking to apply the remedy. The measures we recommend will tend to awaken an interest in the subject, and lead to an intelligent understanding of the means for meeting the dangers that may arise from undue exhaustion of our forest supplies. They will diffuse the benefits gained by experience, for the good of all, and educate public opinion to a degree that will sustain more energetic measures, as their necessities may be hereafter more fully known.

A. A. A. S.
Chairman of the Committee.

THE

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INDIVIDUAL EFFORT IN PRESERVING AND PROPAGATING OUR TREES.*

BY DR. REGINALD A. D. KING, COMPTON, PROVINCE OF QUEBEC.

"Arbores serit diligens agricola, quarum aspiciet nunquam ipse baccam."—CICERO.
[The diligent husbandman plants trees, of which he will never see the fruit.]

IF it is prudent, not to say a duty, of governments and other lessors of large tract of wooded land to make some effort in providing against the undue waste of our timber supply, as also in providing for its reproduction, it must also be wise and advisable that the owners of farms containing a considerable amount of our most valuable kinds of timber, should also be induced to consider well the advisability of making some systematic and continued effort, tending not only to preserve or protect what they have already, but also to propagate what they may find it absolutely necessary to use for commercial or domestic purposes.

Leaving then the broader view concerning the need of something being done to conserve our trees in a general way, I will give expression to a few thoughts about individual effort, confining myself to what I believe to be practical.

A large and important part of this province is divided into farms or lots, comprising seperate holdings. Many of these contain but a limited amount of wood land; others too much for the general purposes of agriculture. The farmer possessing a new lot looks upon every tree as an enemy and seeks to destroy it in order to give himself space for tilling the soil. "Arbores magnæ diu crescunt una hora extirpantur."* To this man it is needless and would be useless to speak now; further than to suggest how he may make the most out of what he is obliged to dispose of. But to the possessor or lessee of the older or cultivated lots—having a part, sufficiently large for general and profitable farming purposes already cleared of its native products—some suggestions may be made having in view the purpose of economizing what he has, as well as the renewal of what he uses yearly for domestic purposes.

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* Presented at the American Forestry Congress at Montreal, in August last.

How then is he to economize, and how propagate?

What can he profitably propagate, and where?

First. How economize?—I would suggest that he should visit his wood land at some leisure time during the decline of summer, and before the "leaf-fall," and that he should systematically calculate how much material for house-warming he may be able to collect from the fallen wood. He should examine the trees as thoroughly as possible, marking those that he finds dead or dying, in order that when he seeks his supply of wood, during the winter, he may be able to cull out these without danger of sacrificing a vigorous and growing tree.

Failing vitality in hard-wood trees, either from age or want of nutrition is evidenced as a rule, in the first stage by the dying of some of the uppermost aud central branches or by the splitting away and falling off of a branch of considerable size, showing symptoms of central decay in the trunk.

This tree may be marked as one not likely to live long, and may, just before or at the cessation of growth, be used for manufacturing purposes. Later on, if the progress towards decay has advanced much, it is useful only for firewood. The same signs may most frequently be the guide relative to the soft-wood trees. These, then, should be the first sacrificed to the ax, always after the supply of fallen and entirely dead wood has been exhausted. The decaying, the dead, the dying, but never the living, when it may be avoided, should be cut down.

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* [Trees grow for a long time; they may be destroyed in an hour.]

It is understood, of course, that I do not presuppose the owner being in a position to oblige him for present needs, to sell any lumber.

Care should be taken while felling or gathering the yearly supply for the house, consumption, or for that required for the fires in the sugar orchard or for any other purpose, that the young and promising trees may not be injured, and that what is needed for making farming tools or vehicles should first be sought out of the fire-wood supply, and that a young and vigorous tree should not be slaughtered because it comes handy.

When gaps occur young trees should be planted so that all the ground may be producing.

Roadways should be made with care by accepting circuitous routes rather than by injuring or destroying the young and living trees.

The lower branches of large and healthy trees may be cut off and used for fire-wood with advantage to the general development of the tree; and in the sugar orchard this will facilitate the movements of the sugar makers.

Secondly. How to Propagate?—This may be done by seed-sowing, but that being slow, and as we are not yet so far reduced in supply as to require it, I will only speak of practical planting.

To be successful certain trees must be planted in appropriate soil, and at a proper time, both as to the growth of the tree and as to the season. The planting should be done with trees, not too large, but of thrifty foliage having a clean unwounded trunk, and these should be removed with all the care that common sense will naturally dictate; the small and remote rootlets being preserved as much as possible. The soil into which the tree is placed for its second living should be as near as possible like the constituents of the soil from which it was taken.

It should be placed firmly in the ground, care being taken to exclude air, and protected from accidental displacement by the wind, by cattle, or by other agents.

The removal and planting should be done on the same day and within the hour if possible, places being previously prepared for their reception, and no tree should be taken up except those needed for the prepared sites.

The transplanting should be done as soon as the frost has left the ground, and this is ascertained in preparing the holes. As the earlier planting is the most successful it would be wise to uncover the turf or upper surface of the ground before being certain that the deeper soil is thawed out, where the planting is to be done, and so facilitate the warming of the ground.

During about one week trees may be transplanted with success, but this time varies as to date, being influenced by the character of the preceding winter and the existing spring.

If possible the soil should be plowed or dug the fall before, so that the turf may rot and the earth become disintegrated by the winter's frost, and that the little rootlets may have a better chance to procure their first meal in their new home, and these little rootlets are the life of the tree.

Thirdly. What to plant and where?—Practically speaking, the most profitable trees to plant in this province, particularly, are the Maple and Elm among the hard woods, and the Cedar and Spruce among the soft; but one may add to these Brown Ash, White Ash, White Birch, Basswood and Lignum Vitæ. For some localities, White Pine, though not generally useful, will grow and become sufficiently large to be valuable.

Butternut and Wild Cherry grow rapidly, and the wood is valuable for manufacturing purposes, as well as for house ornamentation.

If, now, we assume that the farmer has supplied all vacancies in his woodland with young trees, where, then, is he to plant?

I would suggest that he should first make a careful survey of his cleared property for the purpose of ascertaining what he may be able to do in the open outlying fields, and also what he may do about his buildings, orchard and grounds, and also by the highway, in practically carrying out what may become plessing and profitable to himself as well as ornamental.

In the outlying fields he may find spots of broken land, possibly made up of loose shale and but lightly covered with soil, bearing little grass for pasturage, and which can not easily be cultivated by regular plowing. This is the soil upon which the Rock Maple will flourish, if the ledge or rock be loose enough to allow the roots to push their way through the intervening soil. I see every day while traveling over the country, patches of land, varying from one-half to three acres in extent, yielding little or nothing but perhaps a few meals for sheep. Groves of Maple might be planted here. Of course a little more care and work in putting them in would be needed, as the soil and loose rock would require to be moved freely in order to give them a start, but once having taken root, they would grow thriftily.

He may have a patch of moist land perhaps in a pasture, and this soil, which can not be tilled without expensive drainage, may be made to yield Cedar and Ash. Or he may have a bluff or high ridge of land, yielding nothing but profitless bushes. These should be cleared away and rooted up, and, if not interfering with his movements about his cultivated fields, Cherry and Butternut should be planted at regular intervals, and at a proper distance from cultivated soil, and sprouting and useless bushes should be kept cut away.

About his buildings and grounds. If the soil be suitable, I would suggest that he should omit no possible endeavor, and should consider it an imperative duty, to try and procure a growth of Maples tastefully arranged, and not too close to the buildings.

On the north, west and northeast side of his orchard, Maple and Elm, alternately, with an inner row of Fir and Pine would protect his fruit trees, be ornamental, and eventually profitable.

Along the roadside, the majestic and graceful Elm can not be superseded.

In some townships where a generous width is allowed for the "Queen's highway," a row of Elm on the farm side or next the road-fence, and a row of Rock Maple on the inside, each tree covering the space between the Elms, would, while growing and maturing, form a pleasant, shady avenue, and yield the most profit ultimately. If any fail, others should be planted in the following year. The dying among the more mature should be made use of and replaced by others.

Every farmer and every owner of land, it matters not how much or how little, may by the expenditure of a little labor each year, backed by common sense and resolution, not only help to provide for the needs of the future, but materially enhance the value of his property during his own lifetime.

If the farmer will but think the matter out for himself, he must see that it is not likely to be altogether a profitless undertaking for him to give, say, three days or better a week to this object every year, as he is steadily increasing the intrinsic and extrinsic value of his property, while he is, in any case, performing a duty in the proper use of the "talent intrusted" to him, and ought to be stimulated by the remembrance that, while he is doing something for (perhaps) others, he himself is now reaping what others did for him in many ways.

THE PLANTING OF WIND-BREAKS ALONG RAILROADS.

By LEONARD B. HODGES, of St. Paul, Minn.

[The Hon. L. B. Hodges, in an article entitled "Live Fences *versus* Boards," published in the Pioneer Press, of St. Paul and Minneapolis, Jan. 2, 1883, presents his observations and experience in the planting of wind-breaks along railroads, which we deem well worthy of a place in this JOURNAL. After noticing that board fences can not be built in a substantial manner for less than $800 a mile, and that, when eight feet high, they get buried before the winter is over, besides their liability to be stolen and constant tendency to decay, he says:]

"TWO parallel belts of young forest trees planted on the northerly side of the track, and one such belt on the southerly side, will, by good care and thorough cultivation, make a storm-fence which in a few years will prove far more efficient and serviceable in arresting and holding snow back from the track than any board fences yet invented, and when the board fence has become weak and more and more worthless, the live fences or wind-breaks are yearly growing more effective and more serviceable, and, instead of "evaporating," as the board fences do, they stay. If one of the boys occasionally "evaporates" a piece of this sort of fence for a fish-pole, nature sends up a dozen new ones the next season to repair the damage. Just so, if they are broken down by snow-banks during their infancy, nature is ever ready and kind in their restoration. Not so with the piece of board fence—like a moment's time, once gone its gone forever, whether evaporated into thin air through the stovepipe or used in "shimming" up the track. The method of construction is not difficult or complicated in the building of live fences. The first step is to prepare the soil for planting, which we do by first breaking the sod about three inches deep along where the belts of trees are to stand, and of a width sufficient for the rows of trees used in making up the belt or wind-break. Next, and after the sod has sufficiently rotted, repeated and deeper plowings are made, bringing up several inches of new sod at each subsequent plowing; then repeated harrowings until the soil is thoroughly pulverized. In some prairie soils the ground can be thoroughly prepared so as to admit of successful planting the first year. In other more intractable soils, two years may be necessary to bring it to the proper condition. As to varieties of timber, we need something hardy, quick-growing, pliable, adapting itself to all conditions, and cheaply and easily propagated. White Willow fills the requirements probably more completely than any other variety yet tested. It is propagated from cuttings, and when properly handled they are nearly as sure to grow as potatoes. They need very thorough cultivation until the trees have grown so as to prevent the passage of the horse and cultivator between the rows, when they will have so developed as to prevent the growth of weeds and grass among the trees, after which a couple of strips or a sufficiently wide margin of freshly plowed ground next the trees for prevention against prairie fires must be attended to every fall. The White Willow on ordinary good prairie will, with good cultivation, grow to an average height of twelve feet in four years from time of planting the cuttings. In unusually rich moist ground, the growth is much greater, as is sometimes seen at the ends of the cuts near the sloughs, while on the summit of the hill through which the cut is made, the ground being less rich and moist, the growth is necessarily much slower. In such places the Cottonwood is a good tree, and so is the Box-Elder, to mix in among the Willows in the construction of the live fence, because these varieties more rapidly adapt themselves to the varying conditions. The

Green Ash can also be used, and in localities where alkaline salts prevail to an extent that would greatly discourage the growth of the former varieties, the Ash will make a luxuriant growth. From this period, these belts of forest trees soon become the only reliable and thoroughly efficient storm-fences yet constructed, and their value is greatly enhanced by time, which, instead of gradually destroying them, as is the case with the board fence, simply adds to their height, capacity and strength, increasing year by year far beyond the lifetime of the planter. As a mechanical contrivance for arresting and depositing the snow before it reaches the track, it has no equal. It holds full to the top, and the higher the tops get from the ground the greater the capacity; the space in and between the live fence being the reservoir in which the snow-drifts form. In the right of way there should be fifty feet each side of the track absolutely free from all obstructions, and no live fence should be that near the track if a greater width of right-of-way will permit. On the St. Paul, Minneapolis & Manitoba railway, where this sort of storm-fence is proving its efficiency, the right-of-way is 150 feet—seventy-five feet each side the center of the track. The line fence or wind-break occupies a strip of ground inside of and adjoining the outside line of right-of-way, only allowing a strip twenty-five feet wide on which to grow the live storm-fence. I was apprehensive at the time of planting that this would crowd the drifts up too close to the track, with danger of completely burying it. In the month of March, 1881, the space in and between the live fence and the track was pretty well filled up as high as the tree-tops. Another heavy snow-storm, with strong winds, would have filled in and extended the heavy drifts across the track. But fortunately it did not come, and the increased height of the wind-break by two seasons' growth, has so increased its capacity in this direction that the danger is greatly lessened, if not wholly obviated. The experience thus gained on the Manitoba road, has very conclusively demonstrated the necessity of acquiring additional widths to right-of-way limits, where such limits, as in many instances, fall short of 150 feet. On 100 feet of right-of-way limits it would prove a dangerous experiment to rear live fences inside of such limits. Sufficient additional widths must first be secured, either by purchase or condemnation. Referring again to the planting on the Manitoba road, the experience had on this road in the winter of 1881 is conclusive. Where the cuts had been planted with White-Willow cuttings and Cottonwood, and had escaped the ravages of fire and other destroying agencies, they protected the cuts very efficiently. In illustration, let us compare two separate sections of road—the one partially protected by belts of young trees, and the other not so protected. In the first instance, what is known as the Kandiyohi section, some six miles in length, numbering some thirty cuts, many of them decidedly bad ones, was kept open for the regular passage of trains every day during the entire winter of 1880 and '81 by the regular section crew—a very small one, consisting of the foreman (Peter Nelson) and three men—no train even sticking but once, and then not necessarily, but because the engineer allowed his steam to get too low. I have this statement from Mr. Nelson, who has since been promoted to the position of roadmaster on the Brown's Valley branch of the Manitoba road. During the same season, at the same time, the Brown's Valley line, running in the same direction, through the same sort of open prairie region—conditions exactly similar, only not so protected—was so completely blockaded as to prevent the passage of a locomotive over its track for weeks at a time; one blockade, if I remember correctly, lasting over a month, the constant efforts of the railway company with 200 men shoveling snow and with powerful engines "bucking" snow to the contrary notwithstanding. I took solid comfort that winter in occasionally passing over the line to see for myself how the thing worked. My observations tally with conductors, trainmen and others whose occupations called them frequently over the line, to-wit:—that in the big cuts where formerly serious trouble was sure to be had, those portions of the road so planted were least obstructed, and that on level ground, or in cuts so very shallow as to be scarcely noticed, was where the trouble began. On level ground, as soon as the snow had fallen so as to bring it on a level with the track, trouble immediately followed. The next storm buried up the track. The passage of the snow-plow made a long, shallow, continuous cut, increasing in depth with each subsequent passage of the snow-plow, till in some instances cuts were thus formed on level ground up to the car windows. It is due to the cause of Forestry to advert to the melancholy fact that the work of tree-planting on this road was abandoned by the immediate successors of the old St. Paul & Pacific, under whose management the work was inaugurated, and just as the young trees stood in greatest need of care and good cultivation. Prairie fires swept through them; grass and weeds choked them out, and hundreds of thousands were transplanted, and now adorn and enhance the value of many an attractive prairie farm. In wrecking the road, the trees were as badly left as were the stupid, thick-headed Dutch bondholders. It is due to the present management of the road to say that they recognize the value of tree-planting in the manner indicated—that they are trying to protect what trees yet remain, and during the past season, have planted the cuts on the Brown's Valley branch with Willow cuttings and young trees and tree seed in the manner heretofore set forth.

The Northern Pacific railroad, under its present comprehensive management, has undertaken the work in a manner commensurate with its importance. It is the only railroad I am at all familiar with, which has sufficient width of right-of-way to enable it to rear hedges and wind-breaks advantageously. Instead of being limited to 100, or at most 150 feet in width, its right-of-way is 400 feet wide, being 200 feet each side of the center of the track, which leaves a margin each side of the track roomy enough to store away all the snow drifts that are liable to accumulate. The method adopted on this road is similar to that described on the Manitoba railway, but on a much larger scale. The breaking and much of the subsequent deep plowing has been done across the country between Fargo and Bismarck, known as the Dakota division. Some considerable planting has also been done on this division. Ground has been broken and is in preparation for the growing of two parallel belts of forest timber on the northerly side of nearly every cut between Fargo and Bismarck, and also for one such timber belt on the south side of each cut. On the north side, the outer timber belt is placed just within and adjoining the north bounds of right-of-way, 200 feet from center of track. On the same side, about halfway between the outer timber belt and the railroad track, is placed the second timber belt, both belts being parallel with each other and with the road, and extending each way beyond the ends of the cut far enough to conduct the snow across the dump, instead of into the mouth of the cut, as many storm-fences now do. On the south side of the track, one timber belt is being constructed about 100 feet from and parallel with the road. It is the intention of the Northern Pacific railroad company to extend this system of the tree culture until every prairie cut on its entire line, is thereby fully protected from snow blockades. Next spring all the ground that is found fit to plant will be planted, and the breaking of all the cuts on the Missouri division, between Mandan and the Yellowstone, will be promptly done, and also such further deep plowing of this ground as may be deemed necessary, preparatory to planting it another year. What little there is to do in this line of work on the Minnesota division, will be commenced this spring, and put through with all possible dispatch. Some little tree planting was done last May in places along the road within the right-of-way, where the ground had previously been broken and cropped by farmers who had invaded the right-of-way; in all some 500,000 trees on about 100 acres. The greater part of this planting was done on the Missouri slope, and so far has been successful, the young trees, cuttings and tree seeds having made a vigorous and healthy growth, pushing their main tap roots from three to four feet down into the subsoil, with lateral roots of proportionate length. They kept up a later growth than was really prudent, but finally ripened off, and went into the winter in good condition. I do not anticipate any trouble from winter-killing, and expect them to make a much better growth during the coming season. As this region has been so misrepresented as to its agricultural capacities, and has repeatedly been pronounced by high scientific and military authority as an arid waste, unfit for settlement and cultivation, I deem it proper to observe that I saw the heaviest crops of wheat, barley, oats, peas and roots that I have ever seen anywhere for many years, that grew in various localities on the Missouri slope, chiefly in Ridder and Burleigh counties, dur-

ing the past season. I was through the same region during the season of 1880, and found their crops universally first-rate. Having pioneered it during nearly forty years, and seen the country all grow up from Chicago northwest to Bismarck and beyond, I am free to maintain that a very large portion of this so-called arid region is as fertile and as likely to produce remunerative crops as any portion of the great Northwest. I remember when Minnesota was an uncultivated wilderness, with not as good an agricultural reputation as this treeless and so-called arid Territory, and was considered by very well informed people as valuable only for hunting and trapping. We have occasionally the same hot, blasting winds we hear so much about as prevailing in Western Dakota. They inflict the same damage in Minnesota that they do in Dakota, and their withering effects can be palliated to a considerable degree by tree planting. There exists no physical cause to prevent the rearing of broad timber belts around every farm in the treeless region of Minnesota, Dakota, Manitoba and the great open prairie region to the northwest, which now affords free and unmolested passage to these polar waves so hostile to physical comfort and so destructive to the more tender forms of arboreal growth. General and extensive forest tree planting—giving long lines of shelter-belts the preference over small isolated and scattered groves—will ameliorate climatic conditions in modifying those southwestern midsummer red-hot winds that blast the farmer's fairest prospects just when his harvest seems within easy reach, and which bake the surface of the parched earth so as to render it nearly waterproof, thus neutralizing to a great extent the copious rainfalls which frequently follow. The blizzards of midwinter, which can not be wholly prevented, can yet be so obstructed and broken by wind-breaks of timber-belts and groves of forest timber, as to reduce their maximum momentum and practically prevent their disastrous results.

As to the direct effects of tree planting on rainfall, I am not prepared to take a positive stand. I have, for many years, noticed the effects of cultivation which makes the earth a reservoir for holding the rainfall, instead of a roof for conducting it away, as any prairie is to a great extent in an uncultivated region. I have also noticed that the depth of this reservoir increased, and its capacity greatly enlarged when shelter-belts and groves have been grown. There is no subsoiler that compares in efficiency with a grove or belt of forest timber. The roots loosen up the soil to a great depth, thus holding the rainfall. The foliage shades the earth from the influence of wind and sun. Evaporation is retarded. It seems reasonable to suppose that the moisture which arises from these reservoirs, as it reaches cooler currents of air, is condensed into rain, and precipitated and again absorbed by the cultivated soil; and why this process can not be repeated occasionally, and as greater areas are thus converted into reservoirs instead of nearly waterproof sheds, who can tell? Is it not reasonable to suppose, as this process is gradually extended over the arid and treeless region, that in the same proportion will aridity decrease and rainfall become more abundant? This idea has been crowded into my head as the result of a long series of observations. I don't know whether it is correct or not. I think it worth considering. I am endeavoring to demonstrate it. Until it is demonstrated, I can not ask any one to believe it.

You ask as to the difficulties to be overcome. The chief difficulty is the apathy of those most concerned. Nature interposes no such obstacles as the indifference of the men who have the power to promote this work. There are certain things to do, and to know how to do well, that the mass of people who occupy and are yet to occupy our great prairie regions know little about. They come from all quarters of the globe, many of them wholly destitute of the necessary qualifications to enable them to remove the difficulties of the situation. Every thing is new to most of them. The emigration from our Western States is the leaven that lightens the great mass; and I am sorry to say the bulk of that emigration knows more about exterminating forests than growing them. Now the first difficulty to be overcome is in awakening public sentiment to the positive necessity of doing something in this direction. The people who do this work must be aroused, stimulated, encouraged and educated to do it well, and with the least possible delay, and consequently with the least possible cost of time and money. This great difficulty once overcome, all other difficulties vanish. Speaking in behalf of the people of the prairies, we ask the co-operation of the *Pioneer Press* in creating such a well-defined, enlightened public sentiment as will compel the recognition of this branch of popular education by our State legislature to an extent that will make some adequate provision for its promotion. Here is a chance for the representatives of the prairie region to earn their per diem and confer such permanent good on their constituencies as will make their names household words, respected and honored for all time. If this hint is not sufficient, the fable of the boy up the apple tree may become applicable."

SKETCH OF THE DEVELOPMENT OF THE FOREST POLICIES IN GERMANY.

By BERNARD E. FERNOW, of Slatington, Pennsylvania.

(Continued from page 200.)

AS reasons for the better qualification of the government to manage forests were adduced:

1. That sufficient means were at the disposal of the government as well in capital as in the staff of its officials; the organization of the government administration would facilitate and insure control, protection against theft, regulation of larger areas according to demand, equalization of supply and demand. The appropriate time of rotation is more in concert with the tendency and essence of government administration, since the life of the state and its interests out-last all and any rotation.

2. Not the higher financial effect, but the production of the greatest possible raw material should be the aim of state husbandry. Any financial losses which the government might sustain in the administration of the forests were only apparently losses, since the expenditures for administration and management returned to the people in the form of salaries and wages; the loss of interest on the capital invested would be sufficiently counterbalanced by the flourishing of the wood-using manufactures, whose incident enlargement and prosperity would increase their tax-paying faculty.

3. The state, by managing the forests *alone*, was enabled to accomplish other duties assigned to it, to wit: the regulation

of prices, to prevent the occurrence of scarcity, to provide firewood for the poor, to make work for those out of employ, to make its manufactures independent from foreign supply, which seemed desirable from military as well as from mere politico-economical reasons.

4. The forests may be managed by the government without the dangers inherent to other kinds of business, when conducted by the State, since the management and control were not complicated and there was no room or necessity for speculation in forestry.

Lastly, if the government should sell its forests, it would nevertheless require to maintain a forest-department for the superveillance of the forest management of privates and communities. Besides the money resulting from sales would have to be invested again in other property and since none was more adapted for government possession, it would have to be again employed in the acquisition of other forests.

Anyhow, it was said, the status of affairs with the forests in the hands of the government was known to be tenable, while the results of a change could not well be foreseen.

The financial considerations proffered in advocating the maintenance of government forests may be summed up as follows:

Continual and safe flow of revenue from the forests, which would be a security for loans in case of need. The taxes might be reduced in proportion to the profits from the forest administration. The necessity of pensioning off the present officials in case of sale, and the cost of the operation of a sale were urged also as objections to the disposal of state forests.

Another course of reasoning laid stress on the splendor and power of the sovereign incident to the domainal possessions, and argued that the larger these possessions the less danger there would be that real estate and undue power and influence would accumulate in the hands of a few private individuals. The reasons which flow from the recognition of forests in their protective effects (*Schutz-waldung*, protective forests) as the great equalizers of climatic effects, belong to a more recent period.

It is almost the same as producing the whole of the principles of the so-called mercantilistic system of economy, when we try to describe the forest polities of the seventeenth and eighteenth centuries, the basis of which lay in the idea, that the interests of the state and the individual were in eternal opposition, and that the task of the government was to equalize and balance the two, which could only he effected by direct interference on the part of the state authorities.

I have dwelt at some length on the enumeration of these guiding principles in the forest policy of this period, which, though not any more in conformity with our present conceptions, have through their conservative character prevented such disastrous results, as we may expect before long, in this country, unless efficient measures will be instituted in the nearest future for a better husbanding of the extant resources. On the basis of these one-sided mercantilistic ideas, I say, we have been able to gather experience, to try experiments, to establish results, and to slowly develop a sound system of management of one of our greatest objects of national wealth, without impairing the value of this object, without deteriorating the soil of our timber-forests, without destroying the stocks of our coppice-growth. It is this often wrongly applied but well-meant policy of our forefathers which allows us now to call upon over 25 per cent. of the aggregate area of the German Empire as a resource of this material most necessary to modern civilization. It is this saving tendency of old which gives now at a consumption of nearly 10 billion feet of raw material from 35 million acres of woodland a net revenue of from 160–180 million marks equal to 40 million dollars. This consumption is calculated on the reults obtained from the official reports of the government forest administration, which means that it may be increased from 10 to 15 per cent. without any detriment to a perpetual supply of timber and cordwood through all eternity.

No more cries of failing timber-supply may be heard, and, though changes in the forest policy of Germany are constantly going on in accordance with the progress of those sciences, on which the policy bases its working, we need not fear that ever the time will come when we shall have to clamor about forest destruction, because the rules of management are founded on clearly recognized elements, because every proprietor of a forest understands the economic value of his property and his interest in managing it in a rational manner, above all because the question of state forests has been decided beyond dispute, and there is hardly any chance of dissipating these resources in the hands of the governments.

As in all branches of human investigation and development, so in the forestal sciences the commencement of this century marks the beginning of broader, more thorough and special inquiry.

This *progressive* movement followed a period of comparatively retrograde movement in all branches of political economy as a consequence of social revolutions, bred by the teachings of the so-called physiocratist, who, going from the one extreme to the other, stood diametrically in opposition to the mercantilistic ideas.

The question of state forests continued to occupy the cameralistic world. Other considerations, however, came into play, when Napoleon's conquering triumphs brought financial disaster in their train; the credit of the nation was destroyed and the only way to raise money was found in the sale of state property. In Prussia the necessity for doing so was recognized by von Stein, and the King, concurring in this opinion, answers those of his counsellors, opposed to the step as far at least as the forests were concerned: "In regard to the maintenance of the forests as state property, I can not agree with you. Experience and theory unite in contradiction of this. Since the forests of the state can only be utilized by means of a bureaucratic administration, which method has been found decidedly detrimental in agriculture and cattle-farming, the success of forest administration could not well be expected to be better." Large forests, forests bounding the sea as protection against encroaching sand dumes, along rivers for the same purpose, and such forests as are important to the state for the maintenance of important manufactures, etc., were to be exempted from sale.

Very little, however, of the large domanial forests was sold. The finances of the government rallied after the overthrow of Napoleon; the resources were flowing more abundantly with the quickly increasing prosperity of the country; the conviction that an essential difference existed between forestry and agriculture, as operated by the government, gained more and more ground; the doctrine that the forests form a proper object for government administration is to-day almost generally recognized by science. The literature, in regard to this question of state forestry, which originated in the beginning of this century, is as extensive and exhaustive as might be expected on such an important question.

Now, the agitation for the disposal of state forests in Germany has died out. The forestry of the state is recognized as justified by the peculiarities inherent in it, by the high civilizatory import of the forests. Governments and representative bodies in Germany are now rather of opinion, that state forests should be increased instead of diminished. The eternal person of state is considered eminently fitted to follow out the great unchangeable aims of civilization, which are only attainable by the maintenance of a proportionate area and distribution of forest land over the country, much more fitted than the private individual, governed by the quickly changing interests of the day. Nay, many impose on the government the task of acquiring by degrees all the absolute forest soil, which without great economic detriment can never be applied to any other but sylviculture. And so we may say the direction of our times in Germany tends towards a gradual increase of state forests.

A few words might be in place here, to denote the organization of the forest administration, as it exists now generally in all German states. The forest department remains mostly in connection with the finance department; a division into directing, inspecting, and managing officials, is introduced at least in all larger administrations, though the division of the work among these categories is regulated according to very different principles. Especially the amount of free management to be allowed to the local managers, is very differently alloted.

Two systems in this respect are prevailing; the one allowing to the local officer the greatest possible freedom of movement in all matters of management within the bounds of the general instructions, leaving to the higher officials, substanially, only the general administration, examination and approval of the yearly plans of management, presented by the local officer.

The other system tends to throw the main work on the next higher category of officials, and leaves to the local officer only the execution of the plans of administration. The first system, called the Oberförster system, has formed large districts of administration, the latter or Förster system forms small ones. Both systems exist in Germany, in equal estimation and with good results.

Hand in hand with the question of state forestry, another important forest political question reappeared with the development of the new economic principles of our era, which as well in practical state life as in literature, brought to expression widely different opinions, and into existence no less different organizations. This was the question of state supervision of the forests belonging to communities and private individuals. The revolution in state and political economy, which took place through all Europe since 1790, found everywhere in Germany, in existence, an extensive restrictive policy of forest property by the state government. If the growing doctrine of the absolute liberty of property, with all its consequences, should come into unquestionable force, the government would forego the right to superintend or even manage the administration of private and communistic forests, or to restrict or prohibit any actions on the part of the forest proprietor.

Pfeil, of whom you will have heard as a most intelligent and racy writer on forestal topics, with bold language, took up the principles of Adam Smith, and never before were these principles of political economy so cleverly and with such clear and pungent logic applied to the conditions of German forest politics. Yet later on he changed his views substantially and agreed that state supervision was an evil, but a necessary one; he also expressed himself, that he, who should advocate the disposing of the Prussian state forest, should be put into an insane asylum; his views in regard to this subject, expressed 18 years before, he declared to have been ideals.

The controversy could only be more complicated, when a new element was introduced into the contest of opinions, the doctrine of the climatic influence and generally cultured significance of the forests. This happened about 1828, and with it a new difficulty in the question of state surveillance arose, because this special significance of the forest in the economy of nature and of nations had to be proved; the scientific proof of which doctrine seems to be reserved for our times, and will be completed with undeniable data, while many even still doubt the possibility of such influence.

The extent of the right of supervision, which may be claimed for the state government, according to our present conception, has found expression in the Prussian legislation of 1875.

To describe the development of this question of supervision, I can not do better than use August Bernhardt's own words, contained in his admirable work: The History of Forest Property, Forest Management and Forestal Sciences in Germany; especially as it was largely owing to his efforts, that the law above mentioned was drafted and came into practice.

"The legislature," he says, "which regulates the relations of the state towards the forest proprietors, has, since the beginning of the 19th century, suffered profound changes, wrought by the influence of quickly spreading theoretical ideas. By the advocates of the doctrine of the freedom of property, carried out to its extreme consequences, any influence of the government upon the economies of private individuals, was stamped with the stain of irrational husbandry, and stigmatized as absolete reminiscence of the absolute state.

The atomistic tendency of Smith's politico-economical theories severed the great chain, which organically unites the individual economic interests, and puts them into mutual dependence; they denied that the freest movement of those numberless individual economies, into which they split the national economy, could ever do any thing but benefit the culture of a land; they asserted the existence of natural forces, which were bound to produce the economic effect, if only the full freedom of movement were accorded to all unit economies.

Without closely examining, whether the effect of those economic forces was in all cases turning out so surely and necessarily that it might be compared to that of the natural forces without deeply enough penetrating into the peculiarity of the various branches of production, Smith's followers, generalize his ingenious speculative theory in a perilous manner, passing as it were with a sharp logic from inference to inference, and with subtle observation gathering fact after fact in the sphere of economic life which were suitable to support their doctrines. But they neglected to gather as carefully all those facts, which were in contradiction of the theory of free property and unrestrained private economy. They disdained to take cognizance of those processes, which became recognizable especially in forest economy since the beginning of this century, and which stood in sharpest contradiction to that theory. Nay, blind to all that occurred in this direction in almost all civilized European countries, they demanded that the government should cease to manage forests because a series of experiences, gathered from other very different fields of economy, had taught that, generally speaking, industrial arts were conducted much better by private individuals than by the State; they demanded that the utilization of the entire forest property should in future regulate itself only according to the effects of demand and supply, and to the momentary individual interest, which is the only justifiable economic motive, according to Adam Smith.

Thus, soon the practical stood in contradiction to the doctrinal school's tenets. The liberation of private property from all restrictions promoted in many cases a devastation of forests, whilst according to Smith's theories it should have generated the highest economic success. The reasons for this phenomenon are apparent, at least for the middle states of Europe. The war waged against the forests since the oldest times with the object of gaining farming lands had so diminished the forest growth of middle Europe that timber began to fail and prices had to be paid for it which seemed excessive and unbearable. According to Smith's doctrines, now, an increased production—*i. e.*, increased inforestation—should have been the natural consequence. This, in truth, was but rarely the first consequence of that rapid rise of prices. Nay, in the first place, they often induced an increased consumption of the extant wood supply. It is a peculiarity of forestal industry, that it has to work with a large stock, the realization of which is mostly possible at any time, and in this stock of wood it possesses the most significant part of its working capital. An increased demand for timber can be satisfied by the decrease of this stock, and his financial interest induces the private individual to adopt this expedient more readily than the other, namely increased inforestation, which only after a long period of years furnishes useful material; in consequence, it does not allow him to anticipate with certainty as high a price for his timber as the present demand has created, because on account of the slowness of forest production the harvest of growths planted in regions poor in timber often occurs only when the tendency of prices is downward owing to diminished demand.

To the motive for forest devastation, which the high prices for timber effected, others were added, especially that great adaptation in the use of the soil which every nation needs for its economic development, but which carries in itself the danger of forest devastation. Before a people can rise to the highest grade of civilization, to the complete utilization of the vigor of the soil, to the highest agricultural and forestal production, a distinct separation of farming and forest soil is necessary. With this distinction that great process reaches its first conclusion, which begins with the first settlements, and which I have called the war against the forest.

Never and nowhere in this great regulation of the economic conditions of the soil have fatal mistakes been lacking. The Romanic South of Europe destroys, even to this day, often those forests the preservation of which are an absolute necessity for the culture of the land, blindly failing to appreciate the laws of this regulation; nay, indolence there is so enormous that the mistake, though recognized, is not even corrected. In France the greed for farming and pasture grounds has been conducive of that forest devastation and desolation of the mountains, which have so deeply damaged the culture of the fertile grounds.

In Austria, Germany, Switzerland, similar procedures must be recorded and even in the North and Northeast States the temptation of quick realization drains with pernicious haste the long-stored forest treasures.

Everywhere it is difficult to determine the limits which shall divide agriculture and sylviculture, and the richness of the soil accumulated in the forest misleads easily the short-sighted private interest to forest destruction, which is soon followed by deterioration of the soil, when the same, unfit for continued agricultural use, is robbed of its barrens, of its favorable physical properties depending on the cover of the forest. But that line of demarcation must be determined and regarded, if the whole development is to remain normal, and more especially where the interest of the cultivation of the country is concerned, it is unreasonable to consider the forest merely as an object of private speculation.

The recognition of this truth was almost entirely lacking during the period following the wars of liberation. Nevertheless, without clearly discerning the motive which influenced them, many voices were heard protesting against the increasing dicimation of forests. Adam Smith's theories were not able to induce the sale of government forests, and where their influence was strong enough to effect the liberation of private forest property from all restrictions, as in Prussia, the opposite opinions have since then more and more gained ground, and it is precisely the constitutional co-operation of the people in legislature and politics which in Germany has distinctly exacted a rational restriction of private forestry by the State in all cases, where the interest of the whole country is endangered.

I close this very imperfect sketch with the hopes that it may exert some influence, however slight, in stimulating a desire to study more closely the history of this branch of economic sciences in other countries, and that this great republic may so avoid the mistakes and profit by the successful methods of the countries of the old world as that the most distant descendant of the Pilgrim father may never lack the shade of the spreading oak to see with prophetic vision still greater prosperity in the futnre than was beheld by his forefather—as a result of the exertions which the body of patriots here convened will have made in the preservation of America's forests.

REMINISCENCES OF FOREIGN TRAVEL.—(No. 4.)

By the Editor of the American Journal of Forestry.

AUGUST, 9, 1881.—The steamer Aura, in which we had embarked for crossing the Baltic, from Stockholm to Abo, was named after a principal river in Western Finland, and at first sight appeared hardly safe for such a passage. The forward deck was low, and the whole arrangement seemed to fit it for river navigation, rather than a sea voyage. She proved however to be well enough suited for the occasion, for her route lay the whole distance among islands, for the most part thickly dotted over the surface, and consisting of naked gneiss rock, or of low rocky islets, densely covered with pine and spruce. They strongly recalled the familiar scenery of the "Thousand Islands" of the St. Lawrence, whose history and legends we had collected and published a year or two before, but they differed from these in being some hundred times more numerous, and most of them appeared to be uninhabited. In a more open part, and probably near the national boundary, there was a light-house; but besides this, the only aids to navigation were cairns, signal poles and painted rocks, which were well enough suited for clear weather and daylight;—but this route would be wholly unsafe in a fog, and as for daylight, it extends through the greater part of night in summer, while in winter, it is frozen solid throughout.

Many times the way seemed closed on every side, and we appeared to be running recklessly against a rock;—when by a sudden turn, a dozen passages at once opened in as many directions, with long vistas, affording an endless variety of scenery, of the most beautiful kind. We passed several small parties of Russian engineers, engaged in hydrographic surveys, and touched at one or two landings. The maps show that this archipelago is divided up into parishes, and there is probably a considerable population upon the islands, although scarcely a trace of cultivation could be seen. At one point, the steamer upon signal, slackened a little, and there came out from behind an island, a small boat containing several stout young men and one elderly woman. The men all came on board the steamer, with their little baggage;—a parting adieu and tear, told in the universal language, of a family tie separated, if not sundered forever, and the woman returned alone to the shore.

The captain was sociable and inquisitive, and upon our inquiring for *Evois*, he said it would be found in the suburbs of Helsingfors, half a days' voyage beyond Haugo. Arriving at Abo, on the afternoon of the 10th, we spent several hours in looking about the city. It has a population of about 22,000, and is the seat of a Naval Academy. The preparations for a National Exhibition were going on, and our steamer brought a large number of agricultural machines and the like, intended for display. At a bookstore we found an elaborate map of the country, and then ascertained with certainty, that *Evois* was at least a hundred miles north of Helsingfors, and thirty miles from the nearest railway station at Tavastehus,—with no regular line of conveyance between.

Getting under way, with the first appearance of daylight, which here means between one and two o'clock in the morning, we continued our route among the islands, and late in the forenoon, arrived at Hango, from whence a railroad runs by an inland route to St. Petersburg. As the steamer was approaching the wharf, a group consisting of two ladies and several gentlemen, stood looking intently, as if expecting the arrival of friends, and upon an answer to their inquiries from the captain, all eyes were directed upon the writer who stood upon the wheel-house by his side. It was presently known, that one of these ladies was a sister of Director Blomquist, of the School of Forestry at Evois, who having been informed from Stockholm of our intention to stop there, had come to advise going on to Helsingfors. One of the gentlemen was Professor Doner, of the University of Helsingfors; and as he spoke English fluently, and was going on with us, he was soon on sociable terms with all the Americans on board. Two hours or more were spent very pleasantly with this party, visiting points of interest at Hango, which is little else than a long, narrow, rocky promontory, with a railway station and a few summer hotels. It is somewhat noted as a place of fashionable resort in the warm season, and has considerable quarries of red granite. Upon an island some distance in front, the Russian flag floats over a strong fortification, that would meet the first attack from a foreign naval power. The other lady of the party was the wife of the Governor at Tavastehus, who assured us of his kind reception upon arriving at that place.

From the map purchased at Abo, and by the aid of Professor D., we got a very intelligent idea of the communications of the country, and upon our landing at Helsingfors, we received from him, and his brother, who was the American Vice Consul, the most courteous attentions, and most excellent advice. The city is the capital of Finland, and has a population of about 46,000. Besides containing the only university in the country, it is the center of considerable commerce and inland trade. Finland, although subject to Russia, is in every thing but military dependence, self-governing throughout. The Emperor is *ex-officio* the Grand Duke, but every thing is left with a local governor and Parliament. They have their coinage, their postal service, their import-duties, and their finances quite independent of Russia, and the country shows many traces of the laws and customs of Sweden, to which before 1809 it belonged.

We received from Professor Doner, a letter to General E. d'Ammondt, of the Emperor's suite, Governor of the Province of Hamenleena, and as we got seated the next morning in the railway car for Tavastehus, a young Russian military officer took his seat in front. He inquired in English, if the writer was not going to Evois ; and at every station where we stopped, he was at our side. He mentioned the time the train was to wait, and answered every inquiry politely, but was not otherwise sociable. It *may have been* a voluntary civility on his part—it was at least no unpleasant incident. He turned off on a branch road before reaching Tavastehus, giving particular advice before he left, as to the remainder of the way.

We were received by the Governor with the utmost politeness,—his beautiful and accomplished daughter, who spoke the English language with great purity, being called as an interpreter, and were furnished with his carriage and coachman for the remainder of the journey. He sent with these to our hotel, a letter in English, giving the distances between stages where horses would be changed, and the sums that the peasants would expect for their teams. It was the merest pittance—about a quarter of a dollar for two horses and a man for six or seven miles. As the carriage came in at a stopping-place, which was generally a group of low, flat log houses and barns, arranged around a court or yard, one or two young men would start off for the pastures to bring up a fresh team. The carriage, harness and driver went through, while the peasant would ride back to the place where he had started. As the latter took his seat by the driver, we noticed that he generally had his bridle thrown over one shoulder, with several large annular cakes of coarse, unleavened, black rye bread strung upon it. These, at the end of his route, he would divide with his horses as their lunch, giving a mouthful to one, and then the other, occasionally keeping one for his own eating. At each station, the traveler was requested to enter in a book opposite his name, the time of his arrival, his destination, and any complaints he might have to make, as to the service. The driver had instructions to go through to destination, and to await our pleasure for return.

This journey of thirty miles, led over an excellent road, through a cold and to some extent a swampy country, but otherwise well cultivated, the crops being barley, peas, oats, potatoes, turnips and flax, with meadows and pastures, but no fruits other than currants and berries. There were considerable bodies of woodland, and here and there a village of log huts. The population was sparse, and a general air of poverty prevailed. It is indeed geologically, a region that has but recently emerged from under the glaciers, and abounds in lakes and ponds. We noticed several high slender stacks of leaves, put up for winter feed, and there were various indications of long and cold winters;—for this is in over 61° of North Latitude, and under the same parallel as Greenland, and the northern shore of Hudson's Bay.

The public highway appeared to end at a gate; but on passing this, and no longer fenced, the carriage-way led by easy curves through a well-kept woodland, with here and there a little lake, until a mile or two further, it passed a steam saw-mill, and the next moment brought into view the group of wooden buildings of the Forest Academy, that were first seen across a beautiful lake. As our arrival was expected, no time was lost in explanations, and the most generous hospitality awaited us.

The two days spent at this place were most profitably employed, and although in vacation, every care was taken to illustrate the working of the establishment; including the mill, in which steam was got up to show its operation. There are two separate branches of instruction taught here, one for the education of Forest agents, and the other of Forest-guards. The number of students is small, but the course appeared well arranged, and the results very satisfactory. Mr. B. is a Swede, and received his professional training at the Saxon School of Forestry in Tharand.

In wandering through the forests, we noticed that the timber was small, and of slow growth. It was chiefly fir, pine, birch, and poplar, and was not comparable in size or density with our common native forest growth. Experiments had been made with the Siberian Larch, but the plantation was too young to judge of the result. Some years before, we had sent to this place several pounds of seeds of our White Pine, and small parcels of seeds of the Sugar Maple, Yellow Birch, Hemlock, Arbor Vitæ, and Black Cherry. They had come up, and for a time promised to succeed; but a frost one night in mid-summer the year before, had killed every thing to the ground.

Forest products form more than half in value of the exports of Finland, and until recently, no efforts have been made to restrain their waste. This destruction appears in their extensive lumbering operations—in the vicious habit of burning over the surface which prevails—the cutting of timber for making tar, and the use of wood for fencing to needless extent. It was found by recent estimate, that 754 millions of cubic feet are used every year for fences, a large part of which might be saved. At Lat. 61° 30′ the forests are estimated as growing wood to a size for carpenters' use in 60 years in the best soils, and in 90 to 100 years in less fertile places; for sawing, it must grow 100 to 120 years; and at 64°, which is about the average latitude of Finland, 20 years must be added to these figures. In the northern part, they must wait from 120 to 180 years for wood suitable for framing, and from 180 to 230 years for wood large enough for saw logs.

The Crown forests occupy 131,500 square kilometers, (81,711 sq. miles) but by far the greater part of this lies in the northern provinces. About four millions of logs are sawn every year, of which three-fourths are from private lands. At the end of 1875, there were 148 state saw mills in the country run by water, and 61 by steam. Not including those for merely local use.

Seldom has the parting word been spoken with more sincere regret, than on the morning when we left Evois. Although our personal acquaintance had been brief, we had long corresponded, having been brought together in an epistolary way, through the agency of the late Hon. George P. Marsh. Mr. B. accompanied us to his frontier at the gate, and as he gave the parting hand, he said: "We shall never meet on earth again,—may we meet in Heaven!" Returning by the way we came to Tavastehus, after returning thanks to the Governor, and rewarding the coachman, in the manner that had been advised as proper, we took the first train for St. Petersburgh, and arrived there on the morning of August 15th.

We found the object of our visit greatly facilitated at this place through the thoughtful kindness of our friend the Rev. John Croumbie Brown of Haddington, Scotland, who had formerly resided there in charge of the English Chapel, and who had a son-in-law settled there as a banker. The latter was informed of our intended visit, and had arranged with Mr. R—— S———, a native of Scotland, but for forty years a resident of the country, to devote his whole time to our assistance. Mr. S. was a retired banker, and a gentleman of leisure—familiar with the Russian language, and with the various places of interest in and near the capitol. He was also favorably known to the officials with whom we might have occasion to communicate. The Charge d'Affairs of our Government, (Mr. W. Hoffman) in the absence of the Minister, also afforded every facility that could be desired, by advice, a letter to the Ministry of the Public Domains, and in various other ways. We are also indebted to him for more recent intelligence concerning our inquiries, since our return home.

The point of greatest interest at St. Petersburgh, was the School of Forestry, which is located in a suburb about five miles from the central portion of the city, with adjacent groves and gardens, the latter containing labeled specimens of forest trees in great variety; and nursery plantations, for purposes of instruction and practical work. The buildings form a large quadrangular pile with an open court in the middle, and contain all the conveniences for residence and instruction, required for some 350 students, and for a portion of the instructors and their families.

The academy was in vacation, and the Director and most of the students were absent, but we were fortunate in finding professor Dimitry Kagyowdorff at home, and through his courtesy were shown through this great establishment, its library, labratories, collections and class-rooms, and the adjoining gardens and grounds.

This Academy and one at Nova Alexandria, in Poland, are intended for separate Forestry instruction in full course, while one near Moscow, is combined with a school of Agriculture. There is also at Lisinoi, about fifty miles from St. Petersburgh, a Secondary School of Forestry of very practical kind. It is connected with a great Forest estate, and there are establishments for sawing, wood-working, tar-making resin-distillation, charcoal-burning, potash-making, etc., where the details of operation are taught, exactly as they should be practiced with greatest economy and profit. There are also several farm-schools, for elementary instruction in Siberia, Southern Russia and elsewhere.

We had arranged to visit Lisinoi, but having been furnished at the ministry, with all the publications relating to this and the other institutions of the empire, devoted wholly or in part to Forestry instruction, and upon learning that every thing at Lisinoi was closed up for vacation, and that all the instructors were absent, the intention was abandoned.

It was found convenient while at St. Petersburgh, to visit the Botanical Garden, and to call upon Dr. Edward Regel, the Director in charge. From this distinguished botanist and from Mr. C. J. Maximowicz, keeper of the herbarium, both of whom spoke English, the most courteous attentions were received. Dr. R. is well acquainted by correspondence with several of our leading scientists, and Mr. M. had traveled in the United States, and was singularly well informed as to many countries in Eastern Asia, and in America, in which he had resided. The limits of this article will not permit us to notice in detail the extent and importance of this great establishment. We were conducted through green-houses, said to amount to two miles in length, in some of which, though in summer, the atmosphere was kept reeking with a tropical heat, and in which the choicest floral treasures of the torrid zone were in bloom, and in others, stately palms, tree-ferns and other plants, sometimes of large dimensions were thriving under conditions identical with those of their native forests. The rooms that contain the herbarium, would aggregate some five hundred feet in length, and the botanical library was of remarkable extent. We do not remember an American Forest tree that had not a representative in the Arboretum, and many of them of large size.

The statistical and descriptive accounts of the Forests of Russia which were obtained at St. Petersburgh, with such as had been previously received through correspondence, afforded all the data needed for our purpose. A journey to Southern Russia, for the purpose of seeing the result of tree-planting along their railroads was strongly advised, and almost insisted upon; but our time would not permit, as not less than two weeks would be necessary for the journey, and we had much more to see in Central and Southern Europe, within the time that could be allowed abroad. A day or so only was taken for sight-seeing in the Russian Capital, where weeks could scarcely have been enough; but the little time taken was most profitably improved, under the guidance of Mr. S——, who knew full well how best to turn it to account.—Nor did his kind services end, until he saw us seated in a railway car, at the beginning of a journey of a thousand and forty-two miles, which in about forty hours would bring us to *Berlin*, the next point of interest upon our route.

THE HEMLOCK, (*Tsuga Canadensis*), IN MAINE.

By SAMUEL L. BOARDMAN, of Auguste, Me.

[Editor of the Home Farm; formerly Secretary of the State Board of Agriculture; State Statistical Agent for the Department of Agriculture.]

I HAVE been hoping that the brief reference on the map of Maine, (Forestry Bulletin, No. 15, Census of 1880), to the Hemlock, (*Tsuga canadensis*), was not the only information we were to have from Prof. Sargent concerning the distribution and value of the Hemlock of this state. That Bulletin is devoted to the Pine and Spruce supply of Maine, and possibly the Hemlock is not to receive attention. So far, I believe, Hemlock has not been mentioned in any of the State Bulletins issued by Prof. Sargent, save that of Pennsylvania, (No. 11); wherein the Pine and Hemlock supply of that state are given equal prominence. Still, Hemlock is an important tree in this state, and its value for bark makes the industries founded upon it of much consequence to our business. And while awaiting the more accurate information concerning it, to come from Prof. Sargent's Bureau, I trust the few facts and observations which I shall give, may not be wholly without interest to the readers of the Journal.

There are in Maine 2,424,740 acres of woodland, of which it is estimated that on fully two million acres Hemlock is the principal growth.* The distribution of Hemlock in this state appears not to be a matter of latitude, so much as it is a matter of *soil.* And it is not the *elevation* of the land, so much as it is the *character* of the land on which it succeeds best. On high land—what we term our highest hills—the Hemlock does not attain so large a growth, as on lower, (not the lowest), land of forest-growth. The Hemlock that grows on high land, differs materially from that growing on the lower soils, or on what we term the "natural Hemlock land." The trees on the high locations grow tall and slim, and have a finer, thinner, white bark; while those growing on the lower grounds are shorter bodied, and have a coarser, thicker bark, one which contains a large percentage of "gum," on which account it is more highly valued for tanning purposes.

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* *Shoe and Leather Reporter*, Jan. 12, 1882: Vol. XXXIII, page 56.

In New York there are vast quantities of Hemlock much similar in general character to our high-land trees; but in Pennsylvania there are regions in the northern portion of the state in and about the coal formations where this tree is the finest of that of any section in the world.

In order to get a correct idea of the distribution of the Hemlock in Maine, take a map of the state and draw an imaginary line from the town of Smyrna, in Aroostook county, fifteen miles from the New Brunswick border, in latitude 46° 10′, to Mt. Abraham, in Franklin county, latitude 45°. This line will cross the state in a northeast and southwest course, and will represent the northern limit of the Hemlock. The southern limit of the Hemlock belt of Maine will be represented by a line extending from Princeton, in Washington county, near the Grand Lakes, latitude 45° 10′ on the east—ten miles from the St. Croix River—to Sebago Lake, in Cumberland county, on the west, latitude 43° 45′. The average distance of this southern line of the Hemlock from the coast will be thirty-five miles. Within the two lines thus formed, a section through the center of the state sixty miles in width and two hundred miles in length, will be found the natural region of the Hemlock in this state. In this section the growth will be found more dense on the low (not wet) lands than on the higher elevations; but outside of it no Hemlock at all will be found. On the north of this comes the region of the Pine and Spruce; to the south of it the White Pine. I am not now speaking of any of the hardwoods, or deciduous trees. Prof. Sargent's indication of the presence of "a large proportion of Hemlock," on his map of Maine (Forestry Bulletin, Tenth Census, No. 15), is very nearly correct, so far as the northern and western limit is concerned, but he brings the line far too near the coast in Washington and Hancock counties. It is quite noticeable that, while in some portions of the valleys of the Kennebec and the Penobscot, the Hemlock has been found in abundance, it does not ascend the land along these rivers northward, beyond the limit of the line which I have indicated. Or, in other words, if you ascend the valley of the Kennebec and its tributaries, or the Penobscot and its tributaries, as high up as the corresponding section of the Hemlock region of Aroostook county, you will long since have passed beyond the northern limit of the Hemlock on those rivers. Therefore it seems to be well settled in the minds of those who have for years prospected the forests of Maine, that it is soil, and not latitude or distance north, which furnishes the best locality for the growth of the Hemlock. In Aroostook county there is no Hemlock north of Mars Hill, 46° 30′.

It is interesting to note the beginning of the tanning business in Maine, and to observe its exodus from point to point. From forty to fifty years ago Hemlock bark tanneries were numerous in what would be the very center of the Hemlock region of Maine, as indicated above. This embraced the towns Waterville, Vassalboro, China, Canaan, Albion, Unity, Burnham, Detroit, Plymouth, Newport, Stetson, and St. Albans; in the valleys of the Kennebec, Sebasticook, and Piscatiquis, and numerous small tributary streams. The section embracing these towns was all a Hemlock region, and there were tanneries every eight or ten miles. Now there is hardly a tannery of any size in all that section. As the trees have yielded their bark, the establishments have been moved to localities where the Hemlock was more abundant. And so, beginning near its western limit (for there is comparatively little Hemlock in the extreme western portion of this belt), in the Kennebec valley, the tanneries have taken their exodus upward toward the Penobscot and Aroostook waters. There are now tanneries at Dexter and Hartland, for which in many cases the bark is hauled a distance of twenty to twenty-five miles; but the section once alive with tanneries is deserted, and they are now found chiefly in Penobscot, Washington, and Aroostook counties. That section of the state which had the heaviest growth of Hemlock on the land, and yielded the best bark for tanning purposes, was a region commencing at Dover, on the Piscataquis, and extending down the Sebasticook to its junction with the Kennebec at Waterville. So far as I have been able to obtain facts that might reasonably be relied upon, the best producing Hemlock bark land ever cut in Maine was a lot of eighty acres near Moose pond, on the west branch of the Sebasticook, that yielded two hundred and fifty cords of bark. The average product of Hemlock bark in the state is 2½ cords to the acre. At first, or in the days of thirty years ago, the bark was not peeled clean; only the larger growth being cut. But during and after war times (1861–1871) the price of bark was so high that land was cut over a second time for its Hemlock, small trees were peeled, and in some instances the roots of the large trees were even peeled down below the surface of the ground. It is a great injury to peel the small trees. The bark is poor, thin, and white; and its use in leather manufacture is very unsatisfactory. But generally men who purchase Hemlock land for the bark wish to get all they can out of it, and they peel trees that are too small to yield profitable bark. Careful observers tell me that a Hemlock forest will double in size of trees in from twelve to fifteen years—or in other words, a Hemlock will in this length of time increase from a size not sufficient to be valuable for bark, to a diameter of from eight to ten inches, at which size thousands of trees are peeled, although it is much too small. There has been some talk of having a law in this state to regulate the matter of peeling Hemlock, so far as the size of the tree is concerned, but the matter is practically regulated by the owners of the several tanneries, who pay a price for the bark according to its thickness and value.

I give below a list of the locations of the principal sole-leather tanneries in Maine, with their consumption of bark per annum. The amount of leather produced may be obtained practically by allowing ten cords of bark to one ton of leather.

Place of Location.	*Cords of Bark Used Per Annum.*	*Place of Location.*	*Cords of Bark Used Per Annum.*
Winn	6,000	Hartland	2,000
Medway	6,000	Kingman	15,000
Princeton	3,000	Grand Lake Stream	15,000
Lincoln	3,000	Vanceboro	15,000
Bradford	2,000	Jackson Brook	12,000
Moriarville	2,000	Forest City	12,000
Amherst	2,000		
Limerick	6,000	Total	103,000
Dexter	2,000		

In addition to the above tanneries, there are in Maine three large Hemlock-bark extract works, having a capacity of eight thousand cords of bark each per year. The experience with tanners in the use of the bark extract is, that although it can be used well in the manufacture of upper leather, it can not be used successfully in the tanning of sole-leather. It must always be the case, as it has been in the past, that tanneries for the making of sole-leather must, after the bark is all stripped from a section beyond which it can not be profitably hauled, be removed to other localities where the bark is abundant. The present price of Hemlock bark in this state is five dollars per cord. It takes an average of fourteen pounds of ground bark to tan a side of sole-leather.

I am indebted for many of the above facts to the kindness of my friend Mr. Greenville J. Shaw, of Hartland, of the great tanning firm of Shaw & Brothers, Boston, who own or control more than a million acres of Hemlock stumpage in this state.

THE WHITE PINE.

By EDWARD JACK and ROBERT CONNORS.

[The following article, taken from a Saint John newspaper, will afford information of a very practical kind concerning the timber-tree which in former years has supplied a vast amount of hewn timber and sawn lumber to Great Britain, and to the eastern portion of the United States. Mr. Jack, one of the authors, has long been connected with the office of Crown Lands of the Province of New Brunswick, at Fredericton, and Mr. Connors, of St. Francis, on the Upper Saint John, has been one of the most extensive lumber operators upon that river. It will be noticed that the choice qualities of the White Pine are acquired only by great age, and we need not expect these to be acquired in this tree under cultivation, even in places where the conditions are in all respects most favorable, until time has done its work. This should afford a most urgent motive for the protection of our remaining supplies, and for the early and extensive planting of lands suitable for this tree, and which are often of but little value for any thing else.—EDITOR.]

THE largest trees and the best quality of White Pine on the Saint John River grew on the Aroostook and its branches.

There are three varieties of White Pine, which are probably the same tree at different periods of its growth, the difference in its appearance being caused by its age, as well as by the nature of the soil on which it grows. These three varieties are called by lumbermen, "Pumpkin," or "Old Pine," "Bull Sapling," and "Common Smooth-Barked Sapling."

The "*Pumpkin Pine*" usually grows as a scattering tree, often alone, and sometimes it is found in bodies and clusters. It usually grows in the greatest quantities around the shores of lakes and on the banks of large streams, sometimes following small streams to their sources. It also occurs in valleys running into hill or mountain ranges. As you ascend ridges the Pine usually becomes scarcer and more scattering. One sometimes, however, finds a lonely tree towering up like a giant on the summit of some lofty hill, where it may have braved the storms of northern winters from a date prior to the Norman conquest of Great Britain to our own times.

Pumpkin Pine is much subject to hollow rots, the hole commencing at the butt, where it is frequently of large size, but it usually does not extend far up the trunk of the tree. Woodsmen call this "junk-rot." It is a dry rot, as the decayed wood can be taken out in lumps or sections of various weight when the tree is cut down. "Hollow-heart," which is different from junk-rot, runs much farther up the trunk of the Pine, extending sometimes even to the branches. When a tree has either of the two above defects, the sound wood remaining is invariably free from shakes, and of the best quality. The Pumpkin Pine is not so subject to "concase," a defect hereafter to be described, as the Bull Sapling or Common Smooth-Barked White Pine, and it is in general only found where Pumpkin Pine grows thick. The large wood-ant is the greatest enemy of the White Pine. It attacks the tree either in its base or in the branches, where a case-knot, which is caused by the decay of some small branch, occurs. Wherever there is a crack or crevice in the tree, the ant will work his way in. There are generally rift-shakes running through the heart of the very best Pumpkin Pines. This is the ants' grand opportunity, and they avail themselves of it. The ant seldom attacks any other tree than the Pumpkin Pine and the Fir, the former being, on the Saint John River, a very soft wood, indeed softer, freer from sap, and better than the Michigan Pine.

At certain seasons of the year the wood-ants, or probably only the males, are winged; these wings they lose, and old timber-makers say they have seen the ants carrying their wings in their mouths. These ants remain all winter in hollow or rotten places in the Pumpkin Pine, in a torpid condition. When the trees are being felled in winter, it is often the case that bunches of these frozen ants fall out of the holes, and it is no unusual thing for the genuine old Pine timber-maker (a race of men fast passing away in New Brunswick) to gather these frozen ants in his hand and eat them. They say that their taste is much like that of the cranberry. The usual age of the full-grown and mature Pumpkin Pine is likely not less than 800 years, probably much greater. Its wood is very seldom shaky, unless when growing in very wet and swampy places.

Bull Sapling.—This tree also loves the shores of lakes and streams, and its wood is harder and heavier than that of the Pumpkin Pine. It has a thick sap; this sap is thicker on trees which grow scattering among hardwoods on ridges, where the growth is more rapid than in low Spruce lands, where the growth is slow. This tree is almost always more or less shaky at the butt. It is seldom hollow-butted. The best and least shaky trees grow upon the sides of ridges, where they stand exposed to the winds. The tops are usually large and sound, extending a greater distance from the trunk of the tree than do those of the Pumpkin Pine, although the branches of the latter tree are usually much larger in diameter than those of the Bull Sapling. The color of the tops of these trees, when viewed at a short distance, is of a much darker green than those of the Pumpkin Pine. There are many shades of green in the color of the leaves of the Bull Sapling, the best and thriftiest growth being of the darkest green. When a woodsman notices a yellow shade in the color of the tops, he suspects inferior trees, especially on low ground, and these are always shaky. The defects in the Bull Sapling arise principally from rots and shakes. It is seldom attacked by worms unless after it is dead.

Concase.—There are three kinds of "concases," the ordinary open one, the pitch, and the blind. The open concase, is a long and somewhat narrow depression in the side of the tree, the center being hollow. On the outside of the tree, near the bark around the concase, the wood is sound; two or three inches from this sound wood the rot begins, and spreads in every direction, both up and down the tree, frequently for a distance of from five to six feet from the concase. This does not extend around the tree; usually only about one-third of the way. It is the worst kind of concase.

The pitch concase, forms a lump on the outside of the bark, and may be detected by the drops of pitch oozing from the spot. There are generally more than one, and frequently five or six of these on the one tree, generally on one side. The rot does not extend from these nearly so far as from the other two kinds, usually ending at a distance of from one to three feet from the point of their first occurrence in a pitchy wood, streaks from which may extend into the tree.

Blind concase can be detected in the growing tree by the eyes of the experienced woodsman only. The evidence of this defect is the occurrence of a small flat curl in the bark. There is usually no swell in the tree at this place. On cutting into the wood here to a depth of about two inches nothing remarkable is to be seen; cutting in, however, a few inches deeper, the wood appears yellow or dark, and impregnated with pitch. Cutting further in you come to a lumb of black pitch, filling a cavity in the wood, which runs to the heart, the rot extending upwards and downwards from it, usually farther than in either of the other two kinds. Many are usually found in the same tree, rendering it completely useless. Sometimes a tree having blind concases in it is sound at the top and butt. When such is the case the timber-maker frequently deceives the buyer by noticing on which side the concase occurs, and where there is but one of these, hews his timber in such a manner that the concase occurs exactly at one of the angles of the timber. This has often been done on the Saint John River, and the timber has passed inspection there and gone to Great Britain.

Another defect in the White Pine is "case-knot." This consists of a hole two or three inches in diameter, running into the heart of the tree, where it ceases. There is no rot accompanying it. It is caused by the rotting out of a limb, leaving its case, which is a hard rim, behind it. Black knots, which are not much regarded on the Upper Saint John, are caused by imperfect growth of the tree.

The White Pine is one of the thriftiest and healthiest trees which we have; even when half chopped through, it will continue to grow vigorously, and trees which are supported by a mere shell will grow well when the heart is rotten from end to end.

The first indications of death in the Pumpkin Pine and Bull Sapling appear at the top. When this is bare and barkless for a few feet it is a tolerably sure indication that the tree is worthless.

The Common Sapling Pine.—This is abundant every-where, and generally constitutes a large part of the second growth in Pine lands which have been burned, usually occurring with White Birches and Poplars. It is a tree of rapid growth, and in half a century after it starts from the sod, when growing in the soil most suitable to it, will make a good saw-log from 12 to 18 inches in diameter. It grows best in light, gravelly soil. The wood of this tree is seldom shaky, though frequently coarse and knotty.

Shake.—The origin of this defect is uncertain. It is not caused by the action of the wind, since Pine trees are always found more free from shakes when they grow high up on the hill-sides among hardwood trees, where they are exposed to the severest storms, while those growing on flat land under hills, even in the most sheltered places, are always the most shaky. Wet soil and frost are probably the cause of shaky wood. On chopping into a Pine growing in low swampy land in summer, water will frequently follow the ax. This water must exist between the rings of annual growth, and in the winter it forms ice. The expansion caused by freezing destroys the cohesion of the annual rings, and when the board which is sawn from the tree becomes dry the small cracks in the wood show themselves very distinctly, rendering it useless for many purposes.

MISCELLANY.

The Difficulties of Cultivation as we Approach the Arid Regions of Kansas and Nebraska.—As we go west to the borders of the Arid Region generally considered as at about the 100th meridian west of Greenwich, tree-culture becomes difficult and many who have failed in their first experiments have too readily inferred from this that it is impossible. The difficulties come not from barrenness of soil, but from prolonged and excessive drouths, and from hot and drying winds.

It must be admitted that these conditions present difficulties hard to overcome; and that under the best of management, failures will sometimes happen. Under careless methods they will as surely occur. The native herbage of that region has deeply penetrating roots, and they find moisture enough within their reach, to survive the severest drouth. We can best favor this natural tendency by giving the soil a deep cultivation, after the sod has been thoroughly subdued. For planting, we should set the young trees rather deeper than we are accustomed to do under more favorable conditions, and if cuttings are used, but one or two buds should be left exposed. They should be set at as early a time as possible in spring, and in some cases fall planting might be found preferable.

It would be better to cultivate the surface only,—not to a considerable depth, during a drouth. It should be kept mellow by shallow cultivation, simply raking it slightly to keep out the weeds, but not bringing up the soil that might still retain some moisture and thus exposing it to evaporation. If the roots of the trees can get established in a stratum where there is sufficient humidity, they will survive.

"It has sometimes been remarked," says Prof. Bagneris, "that the ground should not be hoed during a drouth. Experience proves, however, differently, by showing that a soil well loosened dries to a less depth, and condenses more dew than the same soil would in a hard and solid state. This is the same as to say—that hoeing at the right moment, is as good as watering." The amount of radiation, and therefore of cooling, and of the deposit of dew, is wholly dependent upon the condition of the surface, and is greatest, when it is kept open by frequent stirring.

The Management of Seedlings in Nurseries, that have a strong tap-root.—Trees like the Oak, Walnut, etc., that send down a principal tap-root, are found difficult to transplant, unless this operation is performed while they are still young. In the most approved practice, such trees are drawn up, and the tap-root is cut smoothly off, when they are immediately replaced. Sometimes a long and very sharp steel spade, with its lower edge oblique to the handle, is used for cutting off these roots without otherwise disturbing the plants. It is pushed into the ground, obliquely under the plants, and is best done in the fall of the first year. It is found that as soon as the spring growth starts, numerous lateral roots start out, all around where the root has been cut off, if the section is a smooth one, and the tree without being sensibly checked in its growth, acquires a mass of fibrous roots that greatly favor its growth when transplanted. In the case of the Walnut, thus repeatedly drawn and reset, at a moist time, and without delayed exposure, becomes fruitful when finally transplanted at an earlier age, than where it has been planted for permanence at first. The cutting off of tap-roots by a spade, can not be practiced successfully, unless the edge is sharp, and the cut oblique. In a stony soil, the instrument becomes dull at once, and in a stiff clay soil, it clogs so that the blade must be frequently dipped in a pail of water. If the soil is very light, the root is pushed along without cutting, and finally breaks, leaving a section most unfavorable for sprouting of laterals around the incision. The operation of transplanting trees with a tap-root, becomes more difficult as they become older, and in a dryer soil and climate.

The Possibility of Growing Trees on the Arid Plains.—A hint may be gained from accident, that may at times be of service. In Western Kansas and Eastern Colorado, one may sometimes see a young Cottonwood tree growing from the bottom of the ditches by the side of the railroads, in regions considered utterly beyond the power of cultivation, except when aided by irrigation. These young trees have started from seeds brought a long distance by the winds; they fell into a soil that receives and retains its moisture longer than that of the general surface, and they have been protected from drying winds. The vigor of growth which these seedlings show, promises well of their future, and if their roots can reach sufficient moisture in these low places, they may become large trees. The hint is suggestive and should be noticed, and acted upon, at least in an experimental way, by those who may have opportunities.

It is a safe precept in planting, in a soil liable to drouth, to place the young trees in depressions, and never to round up the soil about the roots, either in the setting, or in subsequent cultivation. By this means the rains tend to concentrate over the roots instead of being turned away from them. It is in hollow places that the snow always accumulates, and is last to melt. If the herbage is green anywhere, it will be in such places, and this indicates that its roots get more moisture there than elsewhere.

Effect of Clearings upon Floods.—Very recently the valley of the Rhine has been inundated by a flood, causing great destruction to property and loss of life. A correspondent of the Editor of this JOURNAL, who is professor in one of the German Universities, writes that this inundation may be attributed to the clearing off of woodlands in the mountain valleys, where the tributaries of these rivers take their rise. He suggests the appointment of an international commission for investigating the general subject, and determining the amount of reservation that would be necessary for preventing the recurrence of these disasters.

References to the Timber Question in the Report of the Commissioner of the General Land Office.—The Commissioner of the General Land Office reports for the fiscal year ending June 30, 1882, the entry of 17,157 Timber-Culture claims, embracing an area of 2,566,686.09 acres, and increase of 802,886.74 acres. Final proof was made upon 165 entries, covering 23,371.12 acres.

The entries under the Timber and Stone Act of June 3, 1878, were 728; embracing 95,237.02 acres, an increase of 365 entries, and 52,279.10 over the previous year.

Of 152 civil suits and 137 criminal actions commenced for trespass on public timber lands, propositions for settlement were received and acted upon in 110 cases. The number of additional cases under investigation was 418. The estimated value of timber involved in the civil suits was $160,583.86: in cases where proposals for compromise were made, $51,668.84: in the pending cases, $298,876.78. Total, $511,069.48.

Under the head of Timber-Culture Claims, "the Commissioner says:

"The period has but just commenced when the earlier entries made under the Timber-Culture act can be proved up. The fraudulent proceedings at the present time under the operations of this act are not, therefore, that illegal title has actually been obtained by unlawful methods, but that fictitious entries are initiated for the purpose of holding the land out of market and selling to others relinquishments of the right of occupation so acquired.

"It is alleged by numerous correspondents, and in the reports of officers and agents of this Department, that operations of this character are carried on to a very great extent, notably at the present time in Dakota, Nebraska, and Minnesota, and that as a rule, in proportion as public surveys progress over territory subject to such entry, the lands are covered with fictitious claims, and actual settlers are compelled to pay to speculators, or persons holding the claims, a bonus for the privilege of entering the land in a legal and proper manner, under the public land-laws.

"The utility of the Timber-Culture law as an inducement to the cultivation of trees that would not otherwise be planted, has sometimes been questioned, since settlers under the homestead law in treeless regions find it one of the necessities of the situation to set out and cultivate trees, and their interest to do this is a usual guaranty that it will be done. At the same time, I am not inclined to recommend the repeal of a law of so beneficent an intention as the Timber-Culture act. But I deem it incumbent upon me to refer to the abuses to which it is subject."

Under the head of "Timber Depredations," we find the sum of $40,000 appropriated, and $77,365.44 received, of which $24,071.60 were from civil cases, $14,514.67 paid to Receivers of Public Moneys on account of Settlement, $1,625 paid under act of June 15, 1880, and $37,157.17 due on account of propositions of settlement accepted during the year. The materials charged as taken, were 222,734,583 feet of timber, 2,434,525 R. R. ties, 9,685 trees, 176,799 logs, 12,475 poles, 650 cords of bark, 11,050 posts, 20,000 hop-poles, 575,000 shingles, 79,139 cords of wood, 1,100,000 sugar-pine shakes, 65,000 pickets, and number of acres trespassed upon the material not being specified, $60.96, value taken, $2,044,277.92: Estimated value of stumpage, $511,069.48.

In alluding to the execution of this duty of suppressing depredations, the Commissioner says:

"While much has been accomplished in the direction of suppressing the unlawful cutting and removal of timber from the public lands, I am of the opinion that better results can be obtained in the future; particularly so if some general and comprehensive law could be passed, clearly defining who may take timber from the public lands, the purposes for which it may be cut and removed, and prescribing the punishment for unlawful cutting, removing, or in any way wantonly destroying or injuring any timber growing or being upon any of the public lands, or in any way causing or inciting such trespass. Such a law should also establish the the terms and conditions upon which any compromise or settlement should be authorized. A law of this nature would be more generally understood and comprehended than the several different enactments relating to this subject now in force, and could be more easily and evenly administered. "One of the greatest difficulties that presents itself to this office, in the work of suppressing timber depredations, is that of securing efficient and reliable special timber agents. As illustrating the difficulties referred to, it will suffice to say that during the past fiscal year, there have been in the employ of this office for various periods, thirty-one agents, of whom but seven have been in continuous service and remain on duty at the present date.

"Of the various classes of trespass with which this office has to deal, the most numerous are those committed under cover of homestead entries, fraudulently made for the purpose of securing the timber on the land. This class of entries does not seem confined to any one locality, but the fraud is perpetrated wherever there are public timber lands subject to entry under the homestead laws.

"The detection of frauds of this class is not properly a part of the duty of a timber agent, work of this nature being confided to special agents of this office, detailed or appointed for that purpose; but in the pursuit and detection of depredators upon the public timber lands, the timber agent very frequently obtains a knowledge of the unlawful practices resorted to, in order to obtain temporary contract of timber lands, but can not act in regard to the fraud, except to note in his report to this office that there is evidence that the entry was made for fraudulent purposes, and not in good faith as a settler. It would very materially aid in the suppression of trespass, if every case of fraudulent entry could be prosecuted with promptness and vigor.

"I do not apprehend that it is the purpose or desire of government to make the public timber a source of revenue or profit, and therefore the agents of this office are instructed to prosecute their duties with a view to prevent depredations, and to protect and preserve the public lands from being denuded of their timber, without regard to any present pecuniary gain on the part of the government. Accordingly, in all cases where there are extenuating circumstances surrounding the act of trespass, and the party shows a desire to compromise, and makes propositions of settlement before suit has been instituted, the practice has invariably been to recommend the same to the Secretary of the Interior for his acceptance.

"In many cases of trespass, it is necessary to survey the land and scale the logs or stumps to reach a correct estimate of the amount of material involved in the trespass. I would, therefore, respectfully suggest that when such survey and measurement are found to be actually necessary, the cost of same should be charged to the party committing or causing such depredation. Should a settlement or compromise be effected, before legal proceedings are instituted, the trespasser should be required to pay into the hands of the proper receiver of public moneys all cost of such survey and measurement, in addition to the agreed value of the timber cut or destroyed. In cases where legal proceedings have been instituted, and survey and measurement are necessary, the cost of same should be added to and make a part of the costs in the case."

The Commissioner further recommends a change in the mode of paying the expenses of timber agents, by allowing them a fixed sum per diem, instead of itemized accounts, with vouchers for every expense over one dollar.

Decisions under the Timber-Culture and and other acts relating to Planting, etc.— Where the notice of contest against a Timber-Culture entry served upon the defendant contained the single allegation of "abandonment," and the affidavit filed before contest contained the charge of "abandonment," and that said "defendant had failed to cultivate said tract as required by law," no objection having been raised when the parties appeared for trial, it is too late after the trial has closed for the defendant to take advantage of the variance between the notice and affidavit. — (*Case of* Gould vs. Weisbecker, *Aug.* 31, 1881.)

Where an application to enter a tract under the Timber-Culture laws is pending, a Homestead Entry will not be allowed.—(*Appeal of* Anthony Sellman, *from Decision of Commissioner of General Land Office, March* 7, 1822.)

Notwithstanding allegations that the timber entry in question was illegal at inception, the contestant is allowed the preference-right of entry.—(*Case of* Haskins vs. Nichols, *Aug.* 1, 1882.)

Until private land grants are confirmed by Congress, neither the claimants nor owners thereof have a right to cut and remove timber therefrom.—(*Case of* C. N. Gildersleve, *July* 15, 1882.)

Cutting timber to supply a military post in fulfillment for a contract for wood, is not such a depredation as is contemplated by law, unless waste is alleged.—(*Case of* Isaac Oppenheimer, *Sept.* 26, 1882.)

Where an agent fails to do the breaking required in a Timber-Culture entry within the statutory period, the *laches* will be cured if the entryman does or procures the breaking before initiation of a contest.—(*Case of* Ewing vs. Rickard, *Oct.* 9, 1882.)

In a proceeding involving forfeiture, the same strictness of proof is invariably required as under a penal statute. The whole burden is on the party alleging want of compliance, and the acts of abandonment or failure to comply with legal requirements must be affirmatively shown. —(*Ib.*)

Contest dismissed because the affidavit did not allege facts sufficient to constitute a cause of action, in that it failed to allege that the defendant failed to plow or break, or do the planting required by the Timber-Culture law.—(*Case of* Austin vs. Rice, *Oct.* 16, 1880.)

Good faith, not compliance with law, is the essential element in Timber-Culture entries.

A Timber-Culture claimant is not compelled to reside in the State or Territory where the claim is located. —(*Case of* Curtis vs. Griffes, *Oct.* 27, 1882.)

Where a natural growth of timber, varying from six to thirty inches in diameter, is scattered over eighty acres of a quarter-section, such tract is not subject to Timber-Culture entry.—(*Case of* Foster vs. Patterson, *Nov.* 6, 1882.)

When a party acts upon the suggestions of the officers of the Government, he should lose nothing, unless required by the absolute demands of the law, especially when the adverse claim is inequitable. — (*Case of* Schmidt vs. Stillwell, *Nov.* 13, 1882.)

The act of June 14, 1878, restricts a contest against a prior Timber-Culture entry, to one who seeks to enter under the Homestead or Timber-Culture laws, and in the absence of any such application, there is no right of contest.—(*Case of* Bundy vs. Livingston, *Nov.* 14, 1882.)

Without a right of contest under the Timber-Culture law, there can be no preference right under the act of May 14, 1880.—(*Case of* Weum vs. Mickelson, *Nov.* 18, 1882.)

As a requisite breaking was done during the first year, and as the second year had not expired, a contest should not have been permitted. The whole burden is on the party alleging want of compliance, and the cause of abandonment or failure to comply with the legal requirements must be affirmatively shown.—(*Case of* CORRELL VS. WILTON, *Nov.* 21, 1882.)

BIBLIOGRAPHICAL NOTICES.

Oesterreichische Forst-Zeitung. — In this land of newspapers, it may sound surprising, that a subject like that of Forestry, which has interested the minds of a large class of Germans for centuries, should not long before have called forth a weekly medium designed to communicate and discuss points of interest, and more rapidly promote interchange of opinions. Yet we have now before us the specimen number of the *first weekly* forestal paper, called "*Oesterreichische Forst-Zeitung.*"

We have been accustomed to see the subject treated only in yearly, quarterly or monthly journals (of which we count 18 in the German language), and in proceedings of some 20 forest societies. From the prospectus we understand that the new paper, brought to life by the well known editor, Prof. Gustav Hempel of Vienna, does not intend to compete with the monthly journalistic literature, but opens a new field of forestal periodicals, which we would call rather in the line of forest-economy than of forest-science.

Of late years, it has become necessary for the forester abroad to branch out more into a mercantile business, than he used to find necessary in the pursuit of his profession. The progress in perfecting means of transportation, has considerably altered the traffic in forest-products. The local market used to be the only point to be considered in the operations of the management; now this market is disturbed by competition from without, and the element of trade is forced on every local manager and the administration in general. The movement of trade and prices, as yet not touched upon in forest journals, will be therefore welcomed in this new paper. There is also a new movement ahead in the scientific development of German Forestry, and more mental work, discussions and literary effort is called for, which demand a quicker and more rapid exchange of ideas, in order to establish that connection between theory and practice, so necessary for a sound development of Forestry.

In conclusion we want to say, that the paper is perhaps written more in view of Austrian than in broadly German interests.

La Agricultura y los Montes de los Estados Unidos. por. D. José Jordana y Morera; Jefe de primera clase del cuerpo de Ingenieros des Montes. comisionado por el Gobierno para estudiar dichos ramos en aquella nacion.—Madrid, 1880, pp. 378.

[We cheerfully give place to the following notice of this work, "Agriculture and the Forests of the United States," written by Dr. John A. Warder, and can appreciate even more fully than he can, the merits of its author, as upon our arrival at Madrid in the autumn of 1881, we found him expecting the visit, and wholly intent upon making it pleasant and profitable. Scarcely an hour passed before we were on our way to the School of Agriculture; and through his attentions, the most ample facilities were afforded by way of access to collections and objects of interest that the stranger might not readily find. It may interest the friends of Mr. Jordana to know, that since 1876 he has become quite proficient in the English language, and that in 1881 he represented his government at an exhibition in Algeria, upon which he has recently reported.—*Editor.*]

A Stranger's View of our Forests—Spanish Commissioner's Report.—Those who examined in detail any one of the various industries that were so richly displayed in the World's Fair of the Centennial Exhibition at Philadelphia, may remember the very bright intelligence of a young gentleman who superintended the exposition of the Spanish productions. Attentive, intelligent, and punctiliously polite, was the Spanish Commissioner, *Señor José Jordana y Morera*, whose title, "Forest Engineer," accounted for and explained the deep interest he manifested in the collected specimens of woods made by the Agricultural Department of the United States, and by his presence at the meetings of the American Forestry Association. His interest in Forestry was explained by the honorable title he brought from his own country. He had been commissioned by his government to study these branches in our country. During the Exposition he was a close observer, and from the nature and completeness of his report, it is evident that outside of Fairmount Park, as well as within its limits, Mr. Jordana was indeed a diligent searcher after facts illustrative of the agricultural and forestal productions and industries of our widely extended country. It may even be said there are few Americans who may not be instructed by a perusal of this book, written by a stranger. In addition to his own personal observations, made while traversing extensive portions of the country, Mr. Jordana had access, of course, in the public libraries to various reports made in the different States and to those issued by the U. S. Agricultural Department, at Washington. These have been well studied by our author.

His book is divided into several portions, in which he treats: First, of the wide limit with its physical characteristics; secondly, of its agriculture, in the several subdivisions, of planting, farming, stock-growing and feeding, orcharding and gardening. The legislation in its behalf, and the organizations for its advancement are treated of, as existing in the several States, and especially the administration of the Department of Agriculture. He deservedly compliments the excellence of the agricultural implements used in our country, many of which are minutely described and figured in his report.

In referring to the various crops grown in our country, he refers to the vine, and discusses the climatic conditions with which we have to contend in many parts of the country, and observes the causes which prevent the reclimating of the *Vitis vinifera.* He advocates hibridization, but seems to think that despite our Yankee tact, spurred on as it is by patriotic motives, we shall not be able to compete with Southern Europe any-where this side of California. In this he may be correct, but, without quoting Horace, he admits that tastes may become reconciled to what he calls the acidity and roughness of the products of our vineyards. Passing over the consideration of that portion of the report devoted to the description of other agricultural crops and their production, which claimed his careful investigation, we come to that section in which Mr. Jordana turns his attention to the American forests, in which he refers in the most complimentary manner to the efforts of those of our countrymen who have studied the subject. Among these he speaks in praise of Marsh and Emerson, and of those who have elaborated the Forestry reports of our decennial census tables, and particularly refers to the forestal maps of Messrs. Walker & Brewer of the autumn of 1870.

The reports of Mr. Hough, now chief of the Division of Forestry in the U. S. Department of Agriculture, are handsomely noticed, and the Catalogue of Trees prepared by Dr. G. Vasey, botanist of the same bureau, is reproduced entire, as it deserves, on account of its fullness and its accuracy, although new additions have since been made to the lists of 1876.

The lesser lights, who have from time to time entered this field of study, are all passed in review by this indefatigable observer, whose amiable spirit has, perhaps, induced him to attribute more merit to their efforts than is deserved—more, at least, than has been accorded to them by their own countrymen, and certainly more than some of them would claim for themselves.

The beginning of sylviculture, scattered here and there over the country, has not escaped the notice of the reporter, who refers especially to the endeavors to clothe portions of the prairie countries with trees. In this he especially and deservedly refers to the labors of L. B. Hodges, of Minnesota. What would he not be able to say now of this gentleman's planting on the line of the Northern Pacific Railway, or of the planting of whole sections by Mr. Douglas, and of the aggregated work of many citizens, of Kansas on 92,000 acres, reported by Secretary G. C. Brackett, and of the 100,000 acres planted in Nebraska, as reported by Mr. J. T. Allan, and the claim of nearly twice that area of planted trees in the same state, made by Hon. R. W. Furnas!

The reporter pays his highest compliments to our country, by seeing and acknowledging the excellence of many of the productions of its fields and its forests, the processes employed by our people, and the apparatus used in cultivation and in preparing the raw material for transportation and for use—of many of these and our forest trees, he admires the introduction into Spain, as means of improving the agriculture of that country.

Forestry Bulletins of Census.—Since the list was published on page 94 of this volume, we have received three other bulletins of this series, viz:

No. 22. "*Specific Gravity and Ash of the Woods of the United States.*" 4to. pp. 9. This gives the average specific gravity, average per ct. of ash, weight per cubic foot, and approximate relative full value of 418 species, arranged under their natural orders, with their botanical and common names, and the regions where found. The determinations of specific gravity and percentage of ash, were made by Mr. S. P. Sharples, special agent, in charge of the chemical and physical work of this division. The figures refer to absolutely dry wood, and the results are given subject to slight future correction.

No. 23. "*Partial Estimate of the Consumption of Forest Products as Fuel in the United States, during the Census Year.*" One page, with a map of two pages colored. This table gives a total of 140,537,439 cords of wood consumed, with a total value of $306,950,040.

No. 24. "*Amount of Tannin in the Bark of some of the Trees of the United States.*" One page. This contains the results of researches made by Mr. S. P. Sharples upon 27 species, with the percentage of tannin and of ash in each.

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THE WILD-CHERRY TREE.

By Dr. John A. Warder, of North Bend, O.

[Why was it naturally restricted to the region eastward from the Mississippi?—How has it crossed the great rivers to thrive on their western banks?]

THESE questions were being discussed with a friend some years ago at the hospitable home of a prominent editor in Omaha, Nebraska. We had learned from the reports of the United States exploring expeditions that the botanists had failed to observe this tree beyond the Mississippi, and hence the inference was drawn that it was not there. The sharper eyes of Prof. J. L. Budd, of the Iowa Agricultural College, had since detected the tree in his State, but there were still the trans-Missouri regions beyond—how were they furnished, or to be supplied? We knew not, or testimony was all negative, but our host informed us that he had planted them on the high rolling prairie, at the urgent request of the Hon. Horatio Seymour, of New York, with whom it was a prime favorite in his own tree-planting.

This incident has since led to a very interesting correspondence with both the venerable sage of Deerfield and with George L. Miller, of the *Omaha Herald*, who is also a successful tree-planter on quite a liberal scale. The correspondence, by directing attention to the continued efforts of Mr. Seymour in the matter of forest planting and preservation, induced the application to him for a paper on the Wild-Cherry, to be read at the Cincinnati meeting. His advancing years and unfortunate illness prevented his compliance with the request, but the following statements, with extracts from his letters, will be presented as a substitute for a more elaborate paper from his own pen.

The first question must remain unanswered, except that Nature has her own climatic and other conditions, in various regions, that may be more or less congenial to the constitutional needs of this and that tree, and thus we have that charming diversity which pleases us all in her distribution of plants. Man is a disturbing agent, often interfering with her plans, sometimes bettering, and again worsting them, and, one or the other, according to the stand-point taken when we make our observation of the results.

But, how has the Wild-Cherry crossed the great rivers? Let us see, for we know that it has effected an entry upon the plains at different points. The seeds of this tree are heavy; they could not have been transported by the winds, neither were they floated down the Missouri. But man has set his foot upon the other shore; he has plowed up the prairie, inclosed fields, erected dwellings, and in place of the grouse, the geese, the hawks, and owls, another class, the *social birds*, have followed the pioneer and instinctively clustered about him. These, feeding upon the Wild-Cherry in one part of the country, have transported the indigested seeds and dropped them from the fences about the fields in places where they were protected from injury, and obtained a foothold. All the spontaneous trees of this species found in Nebraska were seen in the lines of the fences. This is significant—it is no accident; but indirectly a result of man's interference. Had these seeds been dropped upon the unbroken prairie, they would have perished for the want of a nidus, or had they vegetated the first prairie fire would have destroyed them.

But as we have already seen, man, in the persons of our host and his venerable friend in New York, has also interfered with Nature's distribution of trees. Mr. Seymour had sent, Mr. Miller had planted, and there they were, permeating with their roots the open Lœss soil, so well adapted to them that the plants made good progress.

The sender continued to inquire after the welfare of his venture in the Far West; the recipient could not be otherwise than gratified with the success of his planting, and as he received encouragement as to the behavior of the tree from others of high authority, he has planted more largely and wider of his trees. "The 5,300 walnuts that were burned off had taken a new start with new life in the five years, and are putting on the airs of a young and sturdy forest, the Wild-Cherries and Catalpas are flourishing, so are the Ash and other varieties. My plant is beginning to attract general attention."

Three years ago, acting upon the suggestion of Mr. Seymour, he "planted twenty-five thousand Wild-Cherries, near Omaha, and a recent count (spring of 1882) showed 22,000 of them living and growing superbly." The loss of 3,000 was owing to the severe drougth that set in just after the planting.

In the course of his letter politely declining the invitation to Cincinnati, Mr. Seymour says:

"Tree culture in this country is of great and growing importance; by a wise system of introducing new plants we can add to our national wealth and prosperity. But little has been done heretofore to learn about the habits and qualities of trees which can be made of great value in the mechanical arts and for other purposes; indeed, we know but little about our own trees." [Here is truth and wisdom! That is a key-note from the sage of Deerfield worth more to the people than all the key-notes of all the politicians combined!—W.]

"Those who go from the East to the West are apt to carry with them only the ideas which they have imbibed at their homes near the seacoast. Hence, they discard those trees which did not flourish near the Atlantic, and attempt to cultivate such as are not adapted to the soil and climate of the West, which course has led them into many errors.

"A notable instance of this is the neglect of our native Wild-Cherry tree, which does not attain its full size on the Atlantic coast, while in the region of the Alleghenies it has a rapid growth, and reaches great size and value. Michaux refers to their great size in that region, and I have one on my farm more than fifteen feet in circumference, although it is not very old."

"The wood of this tree is valuable in cabinet-making while it is still comparatively small: it is very beautiful, close-grained, susceptible of high finish, is not heavy, though sufficiently strong, and, when worked up, its rich color is ever deepening with time.

"The Wild-Cherry, as a tree, has other recommendations; it does not form a brush of small and useless branches, but rises with a handsome stem, with large and spreading limbs, where it has room, thus producing more useful wood than the maple and some other trees."

"I learn from Mr. Miller, of Omaha, that the trees do well in Nebraska. If it should grow well on the plains, it ought to be planted in place of the common Water-Maple there used, since it is easily multiplied from seed, grows rapidly, and is a hardy plant able to take care of itself."

"I hope that at your Forestry meeting the advantages of its cultivation and its great value as a timber tree will be fully discussed.

"Very truly yours,

"UTICA, NEW YORK. HORATIO SEYMOUR."

SOME LESSONS WE HAVE LEARNED AND SUGGESTIONS FOR THE FUTURE.*

BY ALEX. McD. ALLAN, GODERICH, ONTARIO.

WE can not honestly or fairly exclaim with surprise at the prevailing opinion of nearly all of our first settlers and a goodly number of their sons, when we hear them say that the forests are only useful for firewood and such commercial timbers as are in demand and can be disposed of at a profit. We must remember that these old heroes came to our country when it was almost one trackless forest, and when the only possible object could be to cut and burn as rapidly as possible, in order to secure land enough to grow the necessaries of life upon. There was no actual intrinsic value in the lumber to them any further than as firewood. To them, the forest has been the one great barrier to progress; it has cost them many a hard day's labor that the present generation knows comparatively nothing about. The pioneer would look with horror and pity upon the poet who pleads with the woodman to spare the old Beech tree; he had no sentimental thoughts in the matter, his chief object being to procure bread for his wife and children. Can we not fancy how discouraging a prospect stood before our fathers, who were, perhaps, possessed of only enough to keep soul and body together for a few months, with a boundless forest before them, and no way of making their bread but by destroying this forest and bringing the land under cultivation. They have thus been schooled into feeling that the same forest we now press forward strong claims in favor of renewing, to a large extent, has always been

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*** Read at the Montreal Meeting of the American Forestry Congress.**

the chief hindrance to successful progress in agriculture. Yes, we can sympathize with the pioneers of this century when we calmly survey the circumstances surrounding them, and we must not be harsh in denouncing those who will not even yet admit the claims of Forestry. It becomes our duty now to press this important subject upon the attention of agriculturalists, and the question very naturally arises, how can we successfully accomplish our desires? We must make out a substantial case before any hope can be entertained of a general adoption of our claims. We must show the agriculturalist clearly that he must not look altogether at the dollars he realizes for the timber now, which he has been brought up to believe it his duty to cut and destroy, but we must prove to him the wealth he is depriving himself of by cutting the forest down any further. He must see how the rivers have thus been changed to very small streams, and rivulets dried up; that the forest exercises an influence upon the rainfall, in distributing it over a large area, instead of sweeping over belts and sections as is so often experienced upon the wide stretches of prairie. Our "old inhabitants" can well remember that when the country was young in agriculture, the rainfall was much more general than it now is. Now, however, in the sections where the forest is meager, we find very general complaint of the extremely sectional rainfall. The present season affords us a good example even in this country.

The interest in Forestry is fast growing among our rising modern farmers, and if we continue to hold up its claims before them, they are a reading class, and will be ready to sift carefully every argument advanced.

Those who are experienced agriculturalists, know that where we are deprived of forest, the dry winds of summer parch the soil and wither or stunt vegetation, whereas where forest exists, the winds, in passing through or over, are loaded with moisture, and thus sweep down upon and over the fields with healthful effect upon the growing crops, carrying very life to every blade and leaf.

No doubt, opinions conflict greatly as to the influence of forests upon meteorology, but the practical man who has been a close observer, knows that forests retain moisture, and, in dry seasons especially, they exert an important influence on growing crops around by imparting this moisture in the form of vapor. We have often noted the fact that in dry seasons especially, fields bordered by forest gave the best crops.

The farmer who is not satisfied with meeting the present emergencies, but prefers, rather than to take a look into the future, judging from the point of demand and supply, will soon find that there are other crops beside grain and the usual produce of the farm that can be made profitable, and possibly at much less cost for labor. In parts of the States of Maine and Massachusetts, I have seen Forestry made profitable practically. Indeed, when we look into commercial values of Canadian timbers for manufacturing purposes, it is easy to see how Forestry can be made profitable.

There are various opinions as to practical Forestry for profit, and for this section of country, looking at the market demand for our various woods and future probabilities, my view is this: I would, in the first place, plant out upon all waste ground on the farm, such trees as are most likely to succeed and be of the best market value. I would plant slow-growing trees, and such as must attain to considerable size before they are fit for use, at say, forty or fifty feet apart, and, between these, others that will come to sufficient maturity for use, in proportion to growth and time they take to arrive at such maturity. Many thousands can be grown on a comparatively small plat of ground, close together, as in nursery rows, which can be cut in say six years, for crockery-crates, handles for forks, rakes, hoes and other implements and tools. Thus, in a twenty-acre plat, after a growth of about six year, there would be a cash return every year. Land-owners have the idea that if they plant forest trees, it will take several generations before sufficient growth has been attained to make the timber of value. This is evidently an error. I mention one very interesting case, that will afford an ample illustration, and one which will prove as much value, I trust, to those desirous of looking into Forestry for profit. Mr. George Leslie, Sr., of the well-known Toronto nurseries, sowed the seeds of various varieties of trees, about forty years ago, and others much later. The trees were cultivated in nursery rows for a few years, and then allowed to grow as in a forest. The past season, Mr. Leslie built a large barn and packing sheds out of the timber of trees raised thus by himself from seed. In these buildings, we find Spruce, Larch, Poplar, Elm, Ash, Maple and other woods, some of which had attained a height of from sixty to ninety feet and a thickness of a foot to a foot and a half. When this has been accomplished within a lifetime, surely we should not feel discouraged when we can procure young healthy trees at a small cost that will mature for use much sooner. Or by transplanting the saplings from our own woodlands, we can very soon cover such ground as we desire with timber. By fencing in a piece of forest and keeping cattle from running in it, we will soon be supplied with thousands of seedlings that can be transplanted. In this way, a ten acre piece of forest will supply enough seedlings to cover fifty acres in about six years.

The experience of the agriculturists in this section on the desirableness of forest culture has ripened into a desire now to look into the subject earnestly. All are ready to admit that we have foolishly cut down the forest, and that, now that we have shipping facilities and good roads, the timbers that were cut, piled and burned, might, to a large extent, have been preserved and marketed as they attained proper age. It is a comparatively rare thing now to find a piece of bush land on one of our farms containing trees suitable for square timber. The demand has been rapidly increasing, and all available timber has been culled out, leaving little else than deformed and young wood. The buzz of the saw-mill used to be heard at almost every road corner. Now, it is rarely heard, because there is no timber supply. The lumber supply used to be large in this western section, and our trade with the cities and larger eastern towns was one of our most prolific sources of wealth. Now we must carry nearly all our lumber from northern districts, that are being denuded, doubtless, in the same manner as our own fair lands.

We have all observed how the winds of winter sweep over us with baneful effect, where they might be employed as messengers of good, as cleansers of the air, and health distributors.

Yes, we feel the want of forest for other purposes too. Almost every farm needs a wind-break in some direction, and many feel keenly the want of such protection. Springs and small streams that used to afford a plentiful water supply the year round for man and beast have disappeared entirely. We find, too, that the birds have left us, with the exception of a few kinds, and these only in small numbers. Farmers have comparatively little of the poetry of life in their composition, and hence, in referring to the absence of birds, we regret the fact on account of their usefulness in destroying insects that are injurious to vegetation and the growing crops. The song of birds is certainly delightful, but when we find that the little friends are of great usefulness, their songs are sounds of welcome.

In this section, we begin to think over ways and means for the protection of the forest now standing, and how we can best promote a taste for Forestry and more general cultivation for profit, as well as ornament. In the town of Goderich, the Council have placed upon the books a by-law, by which any person who plants trees on the streets for shade and ornament, and causes them to grow for two years, becomes entitled to twenty-five cents per tree in cash. This has stimulated tree-planting to such an extent that in a few years the town will bear a forest appearance. In the township of Colborne, one farmer has divided off his farm into regular fields, and planted along the fences trees of various kinds from the forest. These trees are planted about thirty feet apart, and apple trees planted between them. In a couple or three years, when the trees have attained sufficient size, he intends taking away his present fences and running wire fences all over his farm, using the trees as he would posts.

Our West Riding Agricultural Society is likely next year to offer good prizes for the best and largest forest plat planted by any farmer. One enthusiast has already offered $50 towards this object.

But I believe something more than all this is necessary to forward an interest in Forestry. The rising generation must be educated, so that the subject will be fully understood and appreciated. I believe our public common schools should introduce a branch not yet touched upon—Forestry and Arboriculture or general Horticulture. And the school grounds could be utilized for experimental purposes to illustrate these studies in a practical manner. Townships should pass by-laws giving credit on account of taxes to any and every farmer who would do a certain amount of roadway planting. I believe that in roadway planting, the trees should be planted in place of fence posts, and the barbed-wire can be used upon these trees in a few years, and thus we have ornament, shade and the cheapest and best fence any farmer can erect. Following such a course, we can travel with pleasure along our public highways at any time, and especially in winter; these trees break the force of keen winds, and the danger of snow blocking is got rid of as well. Besides, any farm thus beautified will be enhanced in actual market value more than five times the cost of trees and wire.

Railway companies might plant the European Larch or Canadian Tamarac along their lines for ornament, wind and snow break and profit. These trees are fast growing, and would, in a few years, attain growth sufficient to be useful for ties.

Doubtless, there is cause of alarm when we see the destruction of forests being carried on so rapidly, but the warnings already given have been effectual in kindling an interest in the subject, and already we have instances of practical Forestry among our more advanced and modern farmers. Waste lands are being planted and the lake and river banks being utilized. In cutting for wood or square timber, more care is taken to save the young trees and cut only such as can be spared or have reached maturity. We find our bush lands cleared of fallen timber more than in days of yore. In fact, every thing tends to prove that the mind of the modern agriculturist is occupied with the consideration of the interesting and profitable subject of Forestry.

TREE-PLANTING ON THE PLAINS.

[A paper read at Topeka before the State Horticultural Society by Hon. MARTIN ALLEN, of Hays City, Ellis county, Kansas, Chairman of the Standing Committee on Forestry.]

IT has been well said that history repeats itself. As Abraham and Lot, of old, parted from each other on the plains of Palestine, when the pasturage became scanty for their great flocks and herds, so have the people of these United States been continually parting from each other as the means of subsistence became scanty, part of them always pushing westward, and generally to new and more fertile lands.

I very well remember, but little more than forty years ago, of people emigrating from the poorest part of the State of Ohio to the fertile prairies of Illinois, and becoming completely disgusted with the change. Some returned again to their "wife's relations," amidst the dense forests and scanty soils of Southeastern Ohio.

More than thirty years ago I went, myself, out on to the prairies of Illinois, fully a hundred miles, into what Professor Charles S. Sargent, in his article in the October number of the *North American Review* (if I can understand him), is pleased to call the "*debatable ground;*" where, if trees are planted and they thrive, "*the plain is pushed back a little.*" At that time it was thought by many that the soil of the prairies in that region was not adapted to the growth of either fruit or forest trees, nor the cultivation of grasses.

During twelve years of the time I staid there, however, I grew forest trees in abundance, ten to twelve inches in diameter; fruit became a drug in the market, and the cultivated sorts of grasses became a leading crop of the husbandman, and I feel safe in saying that the timber of that whole region of "*debatable ground*" has more than doubled, if not trebled, in the past twenty-five years.

How mightily must the plain have been "*pushed back*" from that quarter!

We have good reason to believe that the same "*pushing back*" has been the rule for hundreds of miles, across mighty rivers and plains, toward the setting sun, wherever civilized man has set up the usual barriers to the annual sweep of prairie fires.

On the 29th day of August, A. D. 1877, I was at Ossawatomie—on the twenty-first anniversary of the memorable battle at that place. On the porch of the hotel a gentleman was telling me of the incidents of 1859 at that place, when the house was new, of the great convention held there, inaugurating the Republican party in this State, and of the speech of Horace Greeley on that occasion.

I called the gentleman's attention to a tree, a foot or more in diameter, near the corner of the house, and asked him how large it was at the time he was telling about. Said he, "Sir, that tree had not then been planted."

Later in the day an old citizen of the place was called upon to describe the battle, and in doing so he pointed out the ground over which the foe had approached, the locality being covered with a dense growth of Oak and Hickory trees that appeared to me to be from six to ten inches in diameter and about thirty feet high. After a slight pause, the speaker said: "That timber was not there then. It has grown since."

The growth was evidently not from any effort of man, other than the prevention of prairie and forest fires.

This was not upon what is denominated as the "*debatable ground*" by Mr. Sargent, but in that region described by him as "*the great plains* remote from the Atlantic, the Gulf, and the Lakes, cut off from the Pacific by innumerable mountain ranges;" and he says "this great interior region receives a meager and uncertain rainfall, sufficient to insure, indeed, a growth of herbage, but not sufficient to sustain even the scantiest forest." . . . .

The same condition of the original forests, extending themselves by reaching out of new growth from their margins, may be observed to be quite general, not only at Ossawatomie, but all over the State up to the sixth principal meridian or further. But there is an imaginary line somewhere away out beyond the center of population in the State, where large herds of cattle and flocks of sheep are more numerous, and people and plowing more scant, and, therefore, prairie fires more frequent and wide-spread, and the natural increase of trees, for these and some other reasons, has not kept up with that of the eastern part of the State. The principal one of the other reasons referred to in the last sentence, is the dry atmosphere and uncertain rainfall, which is mainly due to the rapid natural slope of the country. When an excess of rain falls the drainage is such as to lead the surplus rapidly out of the country, and it is not easily induced to return. The remedy is plain and simple. Let a small dam be built wherever a public road crosses a depression. It will be found upon examination that each mile of road along the section lines (where the roads are designed to be) affords opportunity for from one to five such dams, each capable of holding in reserve, without great expense, from one hundred to one thousand tons of water. Wherever as much earnest effort has been expended upon what is known as the treeless plains to retain the water supply in working the roads, as has been expended in the Eastern and Middle States to overcome their surplus water or to cure their mud-holes, coupled with a reasonable effort in tree-planting, I apprehend that our once treeless plains will have been redeemed from the epithet of *treeless*.

With this digression (if it be such), allow me to refer to my own growing of trees two thousand feet above the sea level, and two hundred and twenty-two miles by rail west of the Capital, where, for the past four years, our average rainfall has been slightly below twenty inches, which, according to Mr. Sargent, would cause our "scanty forest to disappear entirely;" yet, I have to say, notwithstanding his theory and the adverse seasons affecting the matter, that my growths of trees show about as follows, to wit:

Cottonwood......5	inches in	6	years.	Ailanthus........2½	inches in	4	years.
Wild-Cherry 2	"	4	"	Black-Locust....2½	"	4	"
Green-Ash 3	"	8	"	Elm 2½	"	4	"
Hackberry 3½	"	8	"	Black-Walnut..2	"	4	"
Box-Elder.........5	"	7	"				

These are conservative estimates, made from actual measurements, and somewhat exceeded by some of the specimens I have placed upon your table for exhibition, and sustained by other specimens cut at random from the natural forests of Ellis county.

A tree twelve inches in diameter ought to be forty-eight feet high, or four feet in height for each inch in diameter. If less, its limbs should make up the deficiency in height; therefore, five and one-third such trees should make a cord of wood. But to be safe, suppose we take six such trees for a cord, and suppose trees will grow to this size twelve feet apart each way, or three hundred to an acre. That would give fifty cords of wood to the acre.

Cottonwood would reach this size at 14 years from planting; Wild-Cherry, 24; Green-Ash, 32; Hackberry, 27; Box-Elder, 17; Ailanthus, 19; Black Locust, 19; Elm, 19; and Black Walnut at 24.

The value of this wood can be better estimated by each of you for your respective localities than by myself. With us it would now be worth, probably, five dollars per cord in the tree, or two hundred and fifty dollars per acre—some of the sorts less and others more. Some would be worth twice as much for other purposes, and many of the sorts would, no doubt, be worth more to let stand and grow to greater maturity than for any use it could be put to at this age. Many of you may think that these trees could be grown to this size at eight feet apart as well as at twelve. If so, the number of trees would be more than doubled, and, therefore, the profits correspondingly enhanced.

Aside from the expense of planting and the care necessarily bestowed for the first year or two, it will be quite safe to say that the brush and wood obtained from the necessary thinning and pruning would abundantly pay for all trouble and expense in taking care of a timber plantation.

Further experiments have more fully convinced me of the necessity of using only the best stock for planting. In the spring of 1879 I procured from a leading nursery firm in Illinois what they sent me for seedlings of the White-Ash, but I have been unable to discover any difference between it and trees of my own, grown from seed of Green-Ash, gathered in sight of my own door, except that the Illinois grown seedlings have not up to this time made one-half the growth that my own have, both being planted on the same day and in adjoining rows.

Cuttings should be procured only from the best specimen trees. Some sorts may be grafted, using scions from the best growers only. If seeds are planted they had best be put in thickly, and the fittest plants only allowed to survive.

Professor Sargent, in his article heretofore referred to, says: "The removal of a forest from any region will not diminish the amount of rain falling upon it, nor can the increase of forest area, in a slightly wooded or treeless country, increase its rainfall." And, two or three sentences further on, he says: "But if the forest does not cause rain to fall, it husbands it after it has fallen. . . . It prevents the water which has fallen from flowing away too rapidly over the surface of the ground; it protects springs; it checks evaporation, equalizes the temperature, and breaks the force of destructive winds."

I most respectfully submit to this intelligent audience if these are not the elements for the preservation of moisture, and would ask if we are not to look to a moist condition of the atmosphere for rain to what source shall we look?

Does Mr. Sargent wish to be understood that a condition of moisture, or a lack of it, makes no difference in the rainfall of a country?

But Mr. Sargent, if it were possible, seems to blunder worse and worse as he proceeds, for near the close of his article he says: "The law known as the Timber-Culture Act should no longer be allowed to disgrace the statute book," because, as he further says, "it has given rise to *gigantic frauds*, and has already cost the government several million acres of land, which have passed into private hands without any return whatever." Does he mean to say it is a *gigantic fraud* for this government to offer to one of its citizens one hundred and sixty acres of land for planting and cultivating one-sixteenth of its area in timber; or is the *fraud* in the citizen attempting to comply with the offer of the government; or is the *fraud* upon the part of the government; or where, pray, does the *fraud* come in under this act, and how does it become so *gigantic* when the grant is confined to one hundred and sixty acres of land, located where the whole drift of Mr. Sargent's article is attempting to show the land is worthless, and where trees will not, or can not at best, grow without artificial irrigation?

In regard to the "*several million acres*" that have already "*passed into private hands*" under this act, I have to say that Mr. Sargent only shows a wonderful lack of information; . . . because, up to the time of his article going to press, no final proofs had been offered under this law; hence, the government had not parted with a single acre. Fifty final proofs, or 8,000 acres, will cover the total up to this time, December, 1882.

Nor is this at all surprising, because final proof upon this class of claims is only contemplated during the five years following the first eight years after the initiatory steps are taken; and I very well remember, but little more than nine years ago, applying to make an entry under this law, and my papers being rejected because the local land office had not then been supplied with the necessary books and papers for the transaction of business under that law. The government has done well in the enactment of this law. It ought to go one step further, and provide for a School of Forestry, where information could be best obtained, how to proceed with the planting and culture here upon the Plains, where most of the work under the act in question is to be done, and where the work in that line is somewhat different from where forests already abound. It should also further provide that this class of claims can not be changed into others, or, in others words, once a timber claim always a timber claim.

I can not allow this opportunity to pass without saying that the years 1875 to 1878, inclusive, were favorable years for starting trees upon the western plains; that all the years since have been the reverse; that a change for the better can not, in the nature of things, be long delayed. Let us, therefore, look with confidence for good seasons to plant and replenish our timber lots at once. Let us be instant in season and out of season, as Paul was in the spread of the gospel. Let us plow, plant, and carefully cultivate, as becomes men of intelligence in defense of our country, with the full determination not only to help ourselves individually, but also to enhance the public good and to promote the general welfare.

THE NEW FORESTRY LAW OF MASSACHUSETTS.

CHAPTER 255, ACTS OF 1882.

AN ACT authorizing Towns and Cities to provide for the preservation and reproduction of Forests.

Be it enacted, etc., as follows:

SECTION 1. The voters of any Town, at a meeting legally called for the purpose, and the City Council of any City, may, for the purpose of devoting a portion of the territory of such Town or City to the preservation, reproduction, and culture of Forest Trees for the sake of the wood and timber thereon, or for the preservation of the water supply of such Town or City, take or purchase any land within the limits of such Town or City, may make appropriations of money for such taking or purchase, may receive donations of money or land for the said purposes and may make a public domain of the land so devoted, subject to the regulations hereinafter prescribed. The title of all lands so taken, purchased, or received, shall vest in the Commonwealth, and shall be held in perpetuity for the benefit of the Town or City in which such land is situated.

SEC. 2. A Town or City taking land under this act shall, within sixty days after such taking, file and cause to be recorded in the Registry of Deeds for the County or District in which the land is situated a description thereof sufficiently accurate for identifying the same. In case such Town or City and the owner of such land do not agree upon the damage occasioned by such taking, such damage shall be ascertained and determined in the manner provided in case of the taking of land for a highway in such Town or City, and such Town or City shall thereupon pay such sums as may finally be determined to be due.

SEC. 3. The State Board of Agriculture shall act as a BOARD OF FORESTRY, without pay, except for necessary traveling expenses, and shall have the supervision and management of all such public domains, and shall make all necessary regulations for their care and use, and for the increase and preservation of the timber, wood, and undergrowth thereon, and for the planting and cultivating of trees therein. The said board shall appoint one or more persons, to be called

KEEPERS, to have charge, subject to its direction, of each such public domain, enforce its regulations, and perform such labor thereon as said board shall require; and said keepers shall have the same power to protect such domain from injury and trespass, and to keep the peace therein as Constables and Police Officers in Towns.

SEC. 4. Said Board may lease any building that may be on any such public domain on such terms as it shall deem expedient. All sums which may be derived from rents and from the sale of the products of any such domain shall be paid to said Board, and shall be applied by it, so far as necessary, to the management, care, cultivation, and improvement of such domain; and any surplus remaining in any year shall be paid over to the City or Town in which such domain is situated. Said Board shall not, however, expend upon or on account of such public domain in any year a greater amount than it receives as aforesaid.

SEC. 5. A City or Town in which any such public domain is situated may erect thereon any building for public instruction or recreation, provided that such use thereof is not in the judgment of said board inconsistent with the purposes expressed in section one.

SEC. 6. No land shall be taken or purchased, no building shall be erected on any such domain, and no expenditures shall be authorized or made, or liability be incurred under this act by any City or Town until an appropriation sufficient to cover the estimated expense thereof shall in a Town have been made by a vote of TWO-THIRDS of the legal voters of such Town present and voting in a legal town meeting called for the purpose, or in a City by a vote of two-thirds of each branch of the City Council of such City; such expenditures shall in no case exceed the appropriations made therefor, and all contracts made for expenditures beyond the amount of such appropriations shall be void; and all expenditures under this act shall be subject to the laws of this Commonwealth limiting municipal indebtedness.

SEC. 7. For the purpose of defraying the expenses incurred under the provisions of this act, any Town or the City Council of any City, may issue from time to time, and to an amount not exceeding the sum actually expended for the taking or purchase of lands for such public domain, bonds or certificates of debt, to be denominated on the face thereof the "Public Domain Loan," and to bear interest at such rates and to be payable at such times as such Town or City Council may determine; and for the redemption of such loan such Town or City Council shall establish a sinking fund, sufficient, with the accumulating interest, to provide for the payment of such loan at maturity. All amounts received on account of such public domain shall be paid into such sinking fund until such fund shall amount to a sum sufficient, with its accumulations, to pay at maturity the bonds for the security of which the fund was established.

SEC. 8. This act shall take effect upon its passage.

[*Approved May* 25, 1882.]

As one of the first fruits of this legislation a measure has been undertaken in Middlesex County, which can best be known from the following circular that has been issued:

"THE MIDDLESEX FELLS.

"A tract of about 4,000 acres, including nearly 500 of water reservoirs, natural or artificial, is to be made a public Forest, under the care of a State Board of Forestry, according to chapter 255 of the Acts of 1882, whenever the City of Malden and the Towns of Stoneham, Melrose, Medford, and Winchester, have voted to devote each its share of the territory for that purpose. To encourage such a vote, a Board of Trustes has been enlisted, who will receive and hold CONDITIONAL OBLIGATIONS to be collected and paid over to the aforesaid municipalities, when by their concurrent votes the title becomes vested in the Commonwealth.

"All citizens of Massachusetts are interested in restoring the Pines to the barren hills, where they will flourish as nothing else can. Health, wealth, and pleasure, await the success of this grand experiment. Our mother country owes her charming forests to her monarchs and her hunting aristocracy. Must a republic do without them? Must our forests be exterminated because every man is his own monarch? Every man and woman will answer, NO; and, if able, it is hoped will sign the obligation herewith inclosed, after filling it out according to his or her ability, and send it to Mr. HENRY BROOKS, 97 *Beacon Street, Boston,* who is acting as Secretary of the Trustees named in the form of 'Conditional Obligation.'

ELIZUR WRIGHT,

"*January* 15, 1883. *President Middlesex Fells Association.*"

The following is a copy of the conditional obligation above referred to:

"I, ——, of ——, do hereby promise, on the conditions hereinafter stated, to pay to Elisha S. Converse, Samuel E. Sewall, John D. Long, Benjamin F. Butler, Albert Palmer, Edmund Dwight, Francis Brooks, George E. Rogers, Frank B. Fay, Lyman Dike, Daniel Needham, Joseph D. Wilde, Elizur Wright, Mrs. George L. Stearns, Mrs. Julia Ward Howe, Mrs. Dr. I. T. Talbot, Miss Abby May, Mrs. M. Hemenway, Mrs. John E. Lodge, Mrs. Ex-Gov. Claflin, T. W. Higginson, Henry Brooks, Mrs. Mary A. Livermore, Mrs. Luther Hill, Mrs. Prof. C. E. Pickering, Mrs. Charles Sprague, TRUSTEES, the sum of —— dollars, as a donation for the purpose of setting apart and establishing a certain tract of land, called the MIDDLESEX FELLS, as a Public Domain, under chapter 255 of the Acts of 1882, hereunto annexed; such sum of —— dollars to be paid by me on demand of a majority of said Trustees, either in cash or by deed of land within the said Domain, at its assessed value for taxation, whenever the Towns of Stoneham, Medford, Winchester, Melrose, and the City of Malden, each and all of them, by vote or resolution, according to said Act, shall have taken such land, appropriating for the same such sums as a majority of said Trustees shall deem reasonable, and within such boundaries as shall be satisfactory to them; it being understood that—and it is one of the conditions of this obligation—the funds coming into the hands of the said Trustees shall be paid to the several towns in proportion to the assessed value of the real estate to be paid for by each; and that any excess remaining in their hands after all the individual titles are extinguished shall be expended, under their direction, with the consent of the Board of Agriculture acting as a 'Board of Forestry,' in making roads and paths for the convenience and pleasure of the public. Signed: ——.

"Witness: ——."

[We commend the above statute and the proceedings under it, as tending to promote a public interest in Forest culture. It can scarcely, however, be expected that extensive forests will hereafter thus be created and maintained, where the titles are to be acquired by purchase through the actions of Towns and Cities, or by subscription among private owners. Under such circumstances as those under which the improvements upon the Middlesex Fells are undertaken no reason can be foreseen that should hinder complete success. The community of interest thus created should have the happiest effect in promoting an improvement that will long survive those who are active in originating and organizing the enterprise, and the example thus presented should become a model for imitation throughout the country.]

ENCOURAGEMENT OF TREE-PLANTING IN COLORADO.

AN ACT to encourage the Planting of Trees upon the Roadsides, and along the Line of Irrigating Canals and upon Lands under Irrigation. [Approved February 12, 1881.]

SEC. 1. *Be it enacted, etc.:* That whenever the owner or occupant of land under irrigation within this state, has, or shall hereafter plant any fruit or forest trees, there shall not be added any increased valuation in the assessment of said land, by reason of the gain in value that may be acquired by reason of such planting and cultivation, within a period of ten years thereafter.

SEC. 2. That whenever a line of forest trees, not less than sixteen feet apart, shall hereafter be planted, at not more than eight feet from the outer line of a highway upon which his land may border, or along ditches within his land, and kept in good growing condition for three years, there shall be paid as a premium to such owner of the said land, on the fourth year, and for the next six years following, the sum of two dollars for every one hundred trees so planted, provided that said trees be so long kept in good growing condition.

SEC. 3. Any person injuring or destroying any tree or trees planted upon the roadside, or along the line of irrigating canals, or upon private lands, shall be liable for thrice the amount of damage done, to be recovered in a civil action; and in case of malicious injury, he may be further prosecuted for misdemeanor.

SEC. 4. In case of any damage done to planted trees by domestic animals, the owner of said trees may recover full damage from the owner of said animals, as provided in the last preceding section of this act; *Provided*, said trees are planted inside of a lawful fence, or boxed to a height of not less than five feet.

SEC. 5. The county assessors in making their returns shall report the number of trees upon which such premium may be due, under the second section of this act, and may require evidence of the number and condition of said trees, as in other statements by the owners of taxable property.

SEC. 6. The State Auditor shall include in each official report of assessments made to the Governor, a statement by counties, of the number of trees, and the amount of premiums paid under this act.

Sec. 7. In case of any unusual success in growth or management of plantations of trees under this act, the assessors are hereby required to report as fully as practicable, the kind or species of trees, and any facts concerning their care and management that may have been observed. Such special reports shall be written upon separate sheets of paper, and shall be transmitted by the assessors to the State Auditor, who shall transmit the same to the Secretary of the Board of Agriculture for the information of the said Board. Such premium to be paid by the collector of revenue for the county in which such trees may be growing, upon the certificate and affidavit of the county assessor, and such collector shall be allowed pay out of the State Treasury for the same.

UPON THE PUBLIC ENCOURAGEMENT OF FOREST TREE-PLANTING.

[An Address delivered in the Hall of the House of Representatives, in the Capitol of the State of Minnesota, on Wednesday evening, February 21, 1883, by Franklin B. Hough, Ph.D., Chief of the Forestry Division, Department of Agriculture.

Upon the 13th of February last, the writer received a letter from the Hon. Leonard B. Hodges, Secretary of the Minnesota State Forestry Association, inclosing a letter of invitation to address the Legislature and citizens, at the State Capitol upon the subject of Forestry. In this letter he said:

"The inclosed invitation, signed by some fifty members of the Minnesota Legislature, and nearly as many more of the most prominent men in the State, including leading railway officials, State officers, editors, bankers, etc., representing in the aggregate more than $200,000,000, ought to be conclusive as to the interest we feel in the advancement of Forestry."

With the approbation of the Commissioner of Agriculture the invitation was accepted; and as the session was to end on 1st of March, it was found necessary to meet the engagement at as early a date as possible. This was found to be the day above mentioned, and the Hall of the House of Representatives in the new Capitol, at St.

Paul, was by a resolution of the House, appointed as the place for the delivery of the Address.]

IN addressing you upon the subject of Forestry, I will take it for granted, that its importance is realized, and will therefore waste no time in proving what I will presume is an admitted fact—that a due proportion of woodlands in a country, is essential to its highest agricultural prosperity, and that Forest Products are indispensable to the wants of civilized man.

We will first inquire as to what is this proportion of native forests throughout the world, and what relations they have sustained to human history and progress.

In deserts, properly so called, we find but very little life, either of animal or vegetable kind; and if in such places we now find, as in some parts of Northern Africa, in Western Asia and in India, the ruins of ancient civilization, we may be assured that the conditions have changed since these structures were built—for men do not go into desert regions to build, nor to construct reservoirs or irrigating canals for cultivation. They may be driven out by encroachment of the deserts, as is now going on in some parts of Persia and Tartary, and it may require the highest ingenuity and skill to hold the territory fairly in possession, where the physical conditions favor these encroachments. It may be set down as the next thing to impossibility, to win back to cultivation, a region once invaded by the desert sands.

Upon great grassy plains, like the steppes of Russia and Siberia, the Savannas of South America or our own great Plains, we find, so far as due to native races, no settled habitations, no ruins of ancient cities, and no monuments of human industry and art. If such regions are inhabited, it is by roving and pastoral tribes, who move from place to place as the seasons, or the circumstances require. The individual ownership of land is wholly unknown. The earth and its increase are appropriated for the time being, as passing wants may require; and neither inheritance of estates nor progress in the arts is known among them, so long as left dependent upon their own resources.

It may be noticed that such regions are often geologically of more recent origin, and they may possess a fertile soil, inviting to profitable cultivation. The absence of forests may be due to accidental causes, such as annual fires, or simply, perhaps, because the seeds of trees have never been wafted by the winds, or lodged by other natural agencies, in places congenial to their growth. We know that this is so upon the prairies, in the States bordering upon the Mississippi on either side, because no difficulty is found in making trees grow, under intelligent care, upon any part of them.

But it is only in countries interspersed with woodlands, and enjoying the humidity and fertility which this implies, that we find the human race, working out the refinements of science and the arts, and reaching those high attainments in intellectual culture and personal comfort, that distinguish modern civilized life. We may add further, that these attainments can not be maintained in a permanent way, and to general extent, excepting in regions where woodlands may be made to grow.

We may next inquire as to what is due this proportion of woodlands to cultivated fields, and how do they produce effects beneficial to agriculture, and indispensable to its success. In considering this point, we will for the moment leave out of account their use as a source of wood and timber-supply, and consider simply their climatic effect, and the incidental benefits that we derive from their presence.

This will, of course, depend much upon the local climate of the given region, as affected by exposure to moisture-laden ocean winds or winds that come dry and heated from arid plains—it may be influenced by mountain ranges, by latitude, elevation above the sea level, and many other causes.

In Great Britain, the actual percentage of woodland is a little over four per cent, but this does not include the ornamental plantations, than which no country in the world has a finer display. Besides this the British Isles lie directly under the prevailing winds that come laden with moisture from the Atlantic, and from this cause alone, they are protected from any risk of drouth, by reason of clearings, or from any noticeable effect upon agriculture, whether the forests are present or absent.

The same remark will apply to all countries exposed to prevailing sea winds. It may further be stated, as a general rule, that the need of woodland protection increases, as the climate is found dryer, and that as we approach regions of the arid type, a considerable proportion of forest becomes absolutely indispensable to agricultural success.

In Europe, taken together, we find the actual percentage, from the best estimates, about 29.5 per cent. In Austria, it is 29.4; in Germany, 26.1; in Turkey and Italy, about 22; in Switzerland, 18; in France, 17.3; in Greece, 14.3; in Spain, 7.3; in Belgium and Holland, 7; in Portugal, 5.1; in Great Britain, 4.1, and in Denmark, 3.4 per cent.

Applying these principles to the United States, we may say, that the proportion should not be less than one-fourth, and that in regions liable to drouth, it should considerably exceed that amount.

Next:—*How* do woodlands benefit the farmers? In a country like Minnesota, I would say—First, by the shelter they afford against the drying winds of summer and the winter storms. The mechanical obstruction which woodlands present is almost as visible as their shade. Upon this point I will venture to quote from Morton,* an eminent English author, who says:

> "When plantations and strips of woods of considerable extent are so arranged as to obstruct the wind in its course, shelter is afforded both to cultivated and pasture land, and in appearance, as well as in productiveness, the character of the estate undergoes a thorough change.
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> "It can not be doubted by any one acquainted with the losses which are frequently sustained on high-lying farms from nipping frosts and withering winds, that in cold, late districts, *shelter* is of the greatest value to the farmer. Various kinds of crops are liable, at the time of flowering, to be seriously injured, if exposed to strong winds, and frequently cereal crops which are just beginning to ripen suddenly assume a premature whiteness, after being loosened about the roots by severe wind-storms; the crop is imperfectly developed, and the farmer is the loser. Shelter will to a very large extent prevent this evil. Then, at harvest, it has been found that a line of plantations running transverse to the wind, though at the distance of half a mile, has materially diminished the loss from shedding. Along the eastern coast of Great Britain a proper increase of shelter would not fail to add several bushels of grain to the yield per acre, and in Caithness and Orkney, where, simply from the want of shelter at first, timber-trees rarely ever become more than stinted bushes, the increase would be a great deal more.

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* "Resources of Estates," London, 1858.

"The only way in which either forest or hedge plants can be started into growth in these northern countries is to afford them at once the shelter of a stone wall or earth embankment, and often when their tops appear above the upper surface of the protecting dike, they are cut off by the winds as by a knife. This shows in its extreme aspect the importance of that shelter which, in all exposed situations, must in a greater or less degree promote the development of crops.

"The value of shelter for pasture-stock is no less deserving of careful consideration. It is well known to veterinary practitioners that cattle grazing in high and exposed situations, are generally more disposed to consumptive and cutaneous diseases than animals pastured on low and sheltered farms. In cold, backward springs, the shelter conferred even by a very small plantation is to the sheep-farmer in the highland districts of the greatest practical service. On grazings much exposed to withering winds, the large number of lambs deserted by their mothers in late seasons, in consequence of a scarcity of milk, is sometimes a severe loss to the flock-master. But it is well known that on hill farms partially sheltered by growing timber, the percentage of deaths from this cause is considerably reduced. The pasturage, when sheltered even in a very partial manner, is both earlier and more nutritive than if exposed to the full effects of unchecked winds, and in their haunts flocks rarely fail to indicate the situations which are really benefited by plantations, either near at hand or at a considerable distance. It is a well-known principle of animal nutrition that the radiation of heat from the system is greater in a cold than in a warm temperature, and that more food is necessary in the former situation than in the latter to maintain vital heat. If it is practicable, therefore, in the formation of plantations, to elevate the mean temperature of any particular district two or three degrees, it follows that its grazing will not only be improved, but that, in proportion consumed, fattening animals will make greater progress than under less favorable circumstances.

"It appears, therefore, conclusive that the relations that exist between Forestry and Agriculture is a very intimate one; and yet, while great exertions are being made to develop the agricultural resources of the country, the inactivity which has long prevailed in respect to the management of timber continues the same, and presents in some respects an aspect hopeless enough."

We have here a clear and plain statement, not of theories, but of facts. They are presented by one who has made it his special business to study the economies of farm management and the means best calculated to secure the highest possible revenues from landed estates. His entire work bears evidences of talent of a high order, and the precepts of its author with reference to the benefits which woodlands confer upon cultivated fields, are entitled to great attention by every owner of land.

But aside from the simple effects of belts and groves of trees, in affording shelter from the winds, and in which their agency is felt in all seasons of the year, there are other results obtained in the growing season that deserve especial notice.

In summer, and especially in its early part, when vegetation is most active, and while the grain and the grass are in most need of moisture, there is an evaporation going on from the foliage in very marked degree. It is drawn up from the roots, which often penetrate below the reach of common cultivation, and the moisture thus produced can be measured by instrumental observation. The air within, and above, and around the borders of a woodland, is perceptibly more damp than in the open fields, where the surface is exposed to the drying effects of the winds and the sun.

When rains fall upon an open field, they hasten to run off from a sun-baked and impervious surface, which after wetting a little way in, will absorb no more, and the surplus tends to flow away in sudden floods, which as quickly subside when the rain is over. If the rain falls over a wide area, or if the ground is covered with deep snows, the most devastating floods may result.

Let us consider for a moment what effect the woodlands have upon the rains that they receive. In a very light shower the canopy of leaves may intercept the whole, and in a short time it dries up and disappears. But it has gone back into the air, just where it is wanted, and is so much gain. In considerable rain-falls, after the leaves are fairly wet, the whole reaches the ground, and is absorbed by the porous soil. The litter and dead leaves present a resistance to the little currents, should they tend to form, and the pores left by the decaying roots afford so many conduits into the earth, from whence the waters reappear as springs, or prove their presence at a certain depth, in the water of our wells. Being wholly protected from the winds and the sun, the surface evaporation is slight. Although the water pumped up by the roots, and evaporated from the leaves is of great amount, still, from the absorption and the shelter we have noticed, the balance of results is largely in favor of the woodlands, as compared with the fields, with respect to the humidity in the atmosphere and in the soil. We find growing in the forests tender and succulent herbage, such as ferns and the like, that would not live a day in an open exposure to the winds and sun.

Let us dwell for a moment upon this effect of forests upon the rain-fall, and examine as to how and how far they may tend to increase its amount. There have sometimes been made the most unwarrantable statements upon this subject, as if the woodlands could *create* a certain degree of moisture, or *attract* the rains, or cause streams to flow where they never flowed before, and the like, much of which is but a mere fancy, unsupported by facts.

Without going into elementary details, with which it is presumed you are already acquainted, as to the humidity always present in the atmosphere, the capacity of the air for moisture in invisible form, and the increase of this capacity by a rise of temperature and its diminution by cooling, I will simply state, (what I will not here stop to prove, but which could readily be demonstrated,) a few well established facts:

The air always, even in the severest drouth, contains a certain amount of moisture in invisible form. This may be measured as to its percentage, and its tension or elastic force with accuracy, by instrumental means.

When the proportion of moisture reaches a certain point, the air is saturated. Above this it becomes visible as fog, or cloud, and the excess will fall as rain or snow, or will be deposited as dew. This limit is called the *dew point*, and is reached very much sooner in a cold than in a warm atmosphere.

If the air can be cooled down at any time, and especially in a drouth, when the percentage is often *relatively* high, we shall have a precipitation in some form. But some may inquire, how can this be that the air can hold vapor in a dry time? I might ask in reply: "What has become of the moisture at such a time, if it has not been 'dried up' by being evaporated into the air?"

It would be needless to prove that the woodlands tend to cool the air that is within and around them. The "coolness of the groves" has too many refreshing memories of youth—

too many pleasant associations in every stage of life to be forgotten. Now to the extent that the woodlands tend to increase the moisture in the atmosphere, whether by their evaporation, or from the protection they afford from the winds and the sun:—and to the extent to which these agencies cool down the temperature, do they act in causing rain.

In the nicely-balanced economy of nature, a slight change of temperature downward, may cause rain—or upward may prevent it from forming, and this change the woodlands may sometimes produce. Their effect is greatest upon hills, and where they extend across the course of the winds.

Instances might be quoted by the hundred, in which the clearing off of forests has been followed by the drying up of springs and rills, and a marked increase of drouth and diminution of rainy days in a year—while the same regions, if the woodlands are renewed, have had their old conditions restored as to the rains, and the drouths have disappeared.

The effect of woodlands upon the snows, is even more marked than upon the rains. In open fields they drift behind fences, and into the low places, leaving much of the surface exposed to all the dangers that may result to grass and winter grain from alternate freezing and thawing, and to fruits from a too early start in spring. Among trees, and in a country interspersed with groves, the snow does not drift. It lies quietly where it falls, covering the earth with its mantle, and maintaining it in the best possible condition for renewed production with the return of spring. When the snows melt, the water sinks slowly into the ground; it fills the swamps, and is gradually discharged by the streams.

It is but a few weeks since the valley of the Rhine was inundated as was never known before, causing an infinite amount of misery, and a vast destruction of property and of human life. In a letter since received from a distinguished professor in a German University, he attributes this disaster to improvident clearings in the forests around the head waters of that river, and he suggests the appointment of an international commission, for inquiry as to the means by which these calamities may be averted.

But this sweeping disaster in Europe, is quickly followed by one still greater in our own country, and we find the whole

Ohio valley, at this moment, and but as yesterday overwhelmed by an inundation causing such a wide-spread ruin as was never known before. It is yet too soon to count the millions of dollars worth of property that has been destroyed, or the hundreds of human lives that will have been lost, directly or incidentally from this flood.

It may be affirmed with the strongest probability, that this great calamity has been occasioned in a large degree if not chiefly by the clearing off of the forests in Pennsylvania, Ohio, and West Virginia, which had formerly delayed and equalized the melting of the snows, and the discharge of the winter rains. What has happened now, may be repeated again, and there is nothing in the future more certain, than that floods like these, will be liable to recur, until rational and adequate measures are taken to prevent them.

Upon occasions when floods like these have desolated the valleys of the Loire, the Garonne, and other rivers in France, various plans for remedy have been proposed, such as reservoirs, basins of reception, lateral dykes to carry the flood to the sea, and various other expedients, but in following these disasters upward towards the place of their origin, it was finally found necessary to begin where two drops of water begin to unite and form a little rill. In other words, it was found necessary to re-clothe the mountain slopes with woodlands—to restore the ghastly ravines which these torrents had occasioned, as nearly as possible to their former condition, and to adopt thorough measures for maintaining the forest-growth thus established. It was a costly operation, and is still incomplete:—but enough has been done to prove that these methods are effectual, and their whole cost will be less than the amount of damage that one flood might occasion.

The use of wind-breaks in preventing the drifting of snows, along highways, and by the side of railways, is beginning to be pretty well understood in Minnesota;—it may appear out of place for me to say any thing about it, in the presence of Mr. Leonard B. Hodges, who so ably fills the office of Secretary to your State Forestry Association. He has indeed so fully presented his methods, and the *rationale* of their operations, in a recent publication, and which will be included in the March number of the American Journal of Forestry, that I need not give them further notice here.

But for his encouragement and yours, I will here briefly state what has been done in this line in very recent years in Russia, along their railways that traverse a region as naked and dreary as our own great plains.

When at St. Petersburgh in the summer of 1881, upon a journey specially devoted to inquiries in Forestry, some of the officials in their Forest-service took particular interest in mentioning what they deemed a wonderful success in planting along railways in their country. They gave me documents and reports upon the subject, and almost insisted upon my going to see these plantations for myself, as if it needed an eye-witness to realize the truth. From translations that I have procured, I will present the following facts:

In March, 1876, operations were begun upon a region about a thousand feet above tide level, on the open steppe, along the railway leading from Moscow off towards the Crimea. It was treeless, arid, and hitherto regarded as wholly unpromising. In fact the place for first experiment was selected by the officer in charge, with the view of obtaining in case of success a most powerful argument in favor of the plan. Strips of land were broken, deeply sub-soiled, and well harrowed in March, as soon as work could begin, and about the 10th of April, when the spring was well advanced, nursery-plants brought from the forest-districts were set in seven parallel rows about six feet apart. They were of different kinds, the outer row being the hardiest, and the inner row of the quickest-growing species. The earth was not heaped up around them, but was left level. It was well beaten down over the roots, and they were well watered. Some of the plants were even in leaf, but they soon lost their foliage, and it was thought they were lost. In June, however, new buds appeared, and they came forward full of life, and before the end of summer their success was assured. The Locust trees sent up shoots from three to six feet high, and the Elms half as much, the first year, and both were found to succeed perfectly well. The loss was not over one per cent, and a careful examination of the cause of their death showed that the failure was occasioned by their being planted too deep.

It was found necessary to keep them thoroughly weeded, and well hoed. In August, when the dry season came on, almost all the vegetation on the steppe was dried up, and the ground completly covered with cracks:—but the soil in the plantation remained moist, and could be rolled into balls by the hands. At the end of the season a few of the trees were taken out, and their roots were found from two to four feet long, with a large amount of fibrous roots.

In establishing seed-beds for these plantations, it had been found necessary to cover them at first with straw, which was carefully removed as the sprouts began to appear, but was left upon the paths between the beds to keep them moist. The seedlings were transplanted when small, and either the same fall or the next spring, and the most unexpected success has followed the undertaking. The example was being followed upon several lines of railway that had hesitated at first, and the inhabitants of the country, who had previously been wholly incredulous in matters of tree-planting, were fast learning to extend these improvements to the lands in their possession. I was assured that this once treeless waste was beginning to put on some of the aspect of a woodland country—the promise of better to come.

The shelter which groves afford to insectivorous birds, may be mentioned as not among the least of the benefits that they confer upon the farmer. These useful allies of the field will work for nothing and board themselves, asking only protection, and a safe nesting-place for their young.

In respect to injuries from the grasshoppers, it is now well established, that they breed only in arid plains, never in a wooded country, or where any considerable portion is occupied by groves of trees. In their flight they will pass over such regions, rather than alight upon them, and if they alight, they depart sooner, and do much less damage than in an open, treeless country.

It is also found that hailstorms seldom or never originate over a forest, and that their force is broken by passing over them.

From these general statements, we will next pass to consider subjects of more immediate application, in the State of Minnesota. Your State presents the most singular contrasts, with respect to its native timber-supply. Its eastern and north-eastern portions and the "Big Woods" along the Minnesota River were once well wooded, and it was thought by some, they afforded an "inexhaustible supply." The work of clearing off the timber of this region is still going on, without abatement, excepting as one locality after another is exhausted; and however estimates may differ, the time is coming, and probably within the life-time of many persons here present, when lumbering operations will practically be at an end. It will doubtless be found here, as in Pennsylvania, that prudent and far-seeing capitalists will secure some choice timber lands, and hold them as an investment, for a rise in market prices—and it is more than probable, that we shall see and *feel*, a great deal more about timber-monopolies, and combinations for the control of prices, than we have yet known in the past, as fields for operation narrow down, and come within the means of those able to grasp them.

In the western half of this State and occupying in all more than half of its surface, we find immense regions naturally devoid of trees. So far as human history informs us, they have always been so; but this history is comparatively recent, and much of it is within the memory of the oldest inhabitant. In some regions it is certain and in most or all of the remainder it is probable, that this treeless condition has been rendered so by the fires that had over-run it annually, from time immemorial, down to the date of present occupation.

The experience that has been acquired—recent though it may be—has been sufficient to prove that there is no part of the soil throughout the whole of this treeless country but that will admit of cultivation in some form—and I hold it to be the general rule, to which there are few exceptions, that where we can raise crops of any kind we can raise trees.

Among the difficulties which the planter still has to encounter in these regions—in fact one of the worst enemies to the forest in general—may be mentioned *fires*. These perils in a prairie country become less as the country becomes older, for it is the interest of every land-owner to prevent their occurrence, by the careful use of matches, and a watchful attention to the use of fire in every form.

The best mode of preventing their spread, when once started in a prairie country, is in the plowing of parallel belts of ground, and the burning off of the space between—at a time when there is no wind, and when the fires are easily controlled. We sometimes see upon the plains, the blackened trace of a ground-fire, bounded by a line that proves to be nothing but a wagon rut.

In Europe, the most reliable means employed for limiting the spread of fires in a woodland, is the clearing out of open glades, so as to leave no trees nor litter for the fire to consume. Such glades, or "fire-guards," may serve as roads, for the removal of products, and in case of a fire, they afford ready means of access, and convenient lines of defense. In forming new plantations, they should be reserved from the beginning by leaving strips of land for cultivation between the blocks planted with trees.

It is not possible, on this occasion, to spend time in describing methods of planting or management, but I can not leave this subject of forest fires without remarking that although when a fire runs through a plantation killing down the young trees to the ground, the case, however dismal, is not altogether hopeless—for with some kinds, such as the Ash, the Oak and the Elm, there will spring up from the roots a new and vigorous growth of sprouts, for the roots have not been injured, and are full of life yet.

I need not mention the "grub prairies" of this State and of Wisconsin, as an evidence of the vigor and vitality of the roots of trees, because many of you have doubtless seen vigorous woodlands on ground where the pioneer settler could not see a tree nor a bush, and where neither sowing nor planting have been resorted to, in order to secure a woodland growth.

Where a young plantation has been thus killed down by fire, it is best to cut off the dead stems close to the ground, and to allow but one shoot to come up and grow. In 1877, I saw in Nebraska a young plantation of Ash that had been over-run and apparently killed by fire. It was cut back, and in 1880 the same grove appeared almost as forward as if no accident had happened. Indeed this cutting-back, in certain deciduous kinds, is practiced in some cases, as for example the Oak, with remarkable success. The trees when transplanted are naturally checked in their growth. If the season is hot and dry, they get hardened and shriveled, and the buds are small and weak; but when the roots once get well started, such a young tree, when cut back, will take a vigorous growth and in a year or two will have outgrown those of equal age that retain their original stem.

In other cases, sprouts will come up from the roots, as in the case of the Locust, the Ailanthus, and the Poplars, and this may become a convenient way of propagating these species, because cuttings from the roots are quite as sure to prosper as those from the stem.

But leaving these details, I will pass directly to a consideration of forests in their relations to the Government, and as to the ways by which they may be encouraged by the State.

It is well known that in Europe, in nearly every country upon the continent, there are considerable forests which belong to the State, or to communes (usually having rights of common usage), or to public establishments. In all of these there is a perpetuity of ownership that survives the lifetime of those holding the property in charge, and lives from age to age, through all the changes that may happen to the individuals who represent this ownership, in the tenure of this trust.

As a necessary result there has grown up a system of forest management in these countries, for the protection and maintenance of this property, under the forms of ownership above mentioned, but not of private woodlands, which are in all countries, almost as much under the care of their owners as their cultivated fields.

To secure competent agents for the management of these forest estates, special schools of Forestry have grown up, in which a system of technical education is provided for the thorough preparation of aspirants for this service, very much as we have a military and a naval academy, for those intending to devote themselves to the army, or the naval service. Like these, it has its examinations upon entering, upon passing from one class to the next above it, and finally upon leaving. When once received into the service, upon approved trials, there is open to the candidate a career of certain and honorable employment, with its line of promotion, and finally its pensions, as old age approaches.

The sons of these forest officers often have preference for admission at these schools, and instances are common in which the line of office has run through successive generations.

These systems of special education, as to the sciences taught and the methods employed, are very much alike. They differ only as to the jurisprudence of the code and the details of administration, according to the country in which they are. I have visited about twenty of these institutions, including one or more in every country where they exist. They are sometimes connected with a university, or a polytechnic school, in which the lectures upon chemistry, botany, mathematics, and the like, are attended by all students, and only two or three special teachers of sylviculture are employed, while in other cases these are independent, and have a fully organized faculty throughout. They all have libraries, laboratories, rooms for microscopic studies, collections of woods, of tools and implements, and of specimens of natural history in its various departments—nurseries and almost always arboretums properly labeled, and forests for practical instruction.

The students are taken out one or two days in a week by the professors, for excursions and exercises in surveying, mapping, engineering and the examination of forest labors in progress. Some of these schools have saw-mills, and occasionally, as at Lisinoi, in Russia, they have every industry that in any way concerns the forest—such as charcoal-making, wood-distillation, tar and turpentine works, potash works, wood-preserving processes, and the like.

When we remember that the student must show attainments equal to that taught in our best academies, before entering, and sometimes six months or a year of actual labor under a skilled forester besides—that two or three years of diligent study are required for passing the final examinations, and that there is sometimes a term of probation as an assistant before an independent place is assigned—we may justly infer that the agents employed in this service are as a class most thoroughly informed as to their duties, and able to meet any new emergency that may arise. A system of inspection of the forests is introduced, and changes are made among those having local supervision, by which any neglect of duties, or any mismanagement, would be sure of correction, and the plans for working a woodland, when carefully matured and approved at headquarters, are reasonably sure of being carried out, though they may run through a century or more of time.

You will, I dare say, have already thought that systems of management like this can not be applied in a country like ours. I think so myself. However much we may learn—and this is a great deal—from their methods of planting and rearing forests, and of getting out and using their products, we can not derive much aid from their jurisprudence, or their forest-codes. In all of our older States and in most of the newer ones, the farming lands are already in the hands of private owners. The States themselves have generally no lands whatever, upon which woodlands could be grown. The towns and counties have none, and although there are still considerable tracts upon the public domain, the general Government is scarcely able to protect them from wholesale plunder, and public sentiment in the regions where these lands lie is very often in favor of appropriating to private use, whatever timber they need, and in some States and tertories the law now gives them this right.

In cases where there are lands owned by States, under grants for school or other public purposes, the policy of selling them to actual settlers has generally been followed, and under present circumstances any system of forest management under State authority, in any degree comparable with European systems, would be quite impossible.

Now, it is most plainly evident that neither the general or a State government will ever assume the care and expense of planting and managing forests upon private lands. Much less will it be done by cities, counties, or towns. Neither will it ever be done by a tenant, unless he is bound to do so by a contract, and is paid for the service.

This brings us down to the point, which I wish to impress, viz: *That whatever planting is hereafter done in this country must chiefly be done by the owners of the land.*

It may be that in some cases, as by a very recent law in

New York, provision may be made for reserving waste lands when forfeited for the non-payment of taxes, and for retaining them in the possession of the State therever after. In that case the principal motive to this action, appears to have been, to prevent the hydraulic privileges and the water-supply of the Adirondack wilderness from being utterly ruined by clearings, and the country below from being devastated by floods. No provision whatever has as yet been made by law in this connection, for the management of the timber-interests that must become involved—for woodlands were created for man's use—and there can be assigned no possible reason for not taking out the trees fully mature, and passing to decay, in order that others may take their places. The Forester's art does not end with the planting and rearing of timber-trees. It is not finished, until he has carefully taken them out, and delivered them for use, and has started as many more in their places—or rather, since young trees are liable to many accidents, has planted several to every one cut, so as to make sure that at least an equal number shall grow in like manner to full maturity. In the case of New York, there will doubtless grow up a system of conservation and management, in which many things can be learned from the experience of Europe, and by selecting a little here and a little there, there can no doubt be made up a system adapted to the wants of the State, and that shall conciliate the interests required, pehaps including the protection of game.

As to game, since I have come to mention it, I have not much to say, in its relation to Forestry. In Europe, its preservation is among the principal points attended to, and an object of careful instruction in their schools of Forestry. In Germany, the terms "*Forst und Jagd*" (Forests and Hunting) are so closely associated, that they can scarcely be thought of separately.

With us, since from present aspect, the woodlands must in the main belong in future to private owners, the rights of hunting upon his land will pertain to them. It may be necessary in the public interest to restrain even them from killing certain kinds of game upon their own premises; but the law is not strong enough, to give to any man whatever, an exclusive license to hunt upon the lands of another, nor will public opinion ever justify a law that forbids the killing of any kind of game that is a serious damage to the farmer.

As for the rest, if the western planter shall ever have occasion to breed jack-rabbits in his nurseries, or gophers in his osage hedges, there is time enough to arrange a law protecting him in this privilege when the need arises.

In short, I have come to look upon the game question as wholly independent of American Forestry, and hunting privileges as very likely to belong to those who have got land to hunt upon. We have no privileged classes, who may ride through grain-fields not their own, in pursuit of game, nor shall we ever have laws, as in Europe, that forbid the farmer from building fences too high for a hunter's horse to leap, or that restrain him from injuring a wild animal that is devouring his crops.

In our Forest-legislation we must begin *de novo*, and we may notice at least one thing in our favor. We have no rights-of-common to deal with as they have in Europe. There, one of the greatest difficulties that the Forester encounters, is that of managing the rights of usage, to which the inhabitants of communes have been entitled from time immemorial, and from which it is scarcely possible to restrain them. They have been allowed to use wood for fuel, and timber for building. They could gather leaves and litter for their stables, and could pasture their cattle, and fatten their swine in the forest. They could gather green leaves for fodder, and nuts and fruits for their use. These are vested rights, and the people must be protected in their enjoyment. Indeed one of the subjects taught in their schools of Forestry, relates to these rights of common usage, and the problem involves questions of the most intricate and perplexing kind, but from which we are forever free. Even in British India, where a system of Forest-management is of but very recent date, the rights of villagers to clear off and burn over a tract of woodland for their cultivation two or three years, and then another, and so on until the first patch has grown up, and its fertility has been again restored for another cutting, has from the beginning proved a serious obstacle in the way of the administration. The custom has been sanctioned by usage from time immemorial, and was almost as difficult to meet, as the prejudices of caste.

Having noticed some things that can not, or that need not be done by Government, let us next consider what might and should be done, in providing for the future, in the matter of timber supply. In speaking of the *future*, I mean, the time near at hand, and the wants to be supplied, those that will be felt by the living age.

I will begin with what I regard as the duty and the opportunity of the National Government in the way of maintaining our Forest supplies upon the public domain, and of encouraging the work of planting upon private lands.

We have still considerable bodies of timber upon the public lands. It has been our policy to get these lands occupied and cultivated by a resident population as rapidly as possible. After selling them for a long time at a dollar and a quarter an acre, we have of late been giving them away to actual settlers, or as tree-culture claims, as bounty lands or otherwise; and have granted enormous tracts in alternate sections to railroad companies, hoping that by thus securing internal lines of communication, to speedily settle the whole.

What has thus been parted with, can no longer be controlled as to its cultivation. It is too late to insert new conditions after an entry has been made, even though the title has not yet been perfected. Unfortunately, there have been no stipulations for planting, excepting in the timber-culture acts, and even these are defective in not requiring lands once entered under them to be forever after open to entry under these acts only.

It would be better still had there been a requirement that at least ten acres in a quarter section should be perpetually kept under timber culture as a condition of the title. The first of these would have defeated one of the present opportunities of evasion that is most complained of, namely: the practice of entering timber-culture claims with the hope of selling out the chance in a rapidly settling region, by abandonment for new entry, under another form of title.

I will go a step further than the obligation of maintenance of a certain portion in timber upon lands granted under these acts, and would insist upon the requirement as applicable alike to all the public lands still belonging to the public domain, whether timbered or not, and in every part, wherever possible to plant trees with success. If treeless, I would require a certain portion to be planted and kept in timber. If now a forest, I would require a portion to be kept so, as a condition in the title, through all coming time. There would, of course, be exceptional cases to be provided for, and provision might be made for these by law.

Let us briefly consider another point in reference to the woodlands still remaining on the public lands. They are mostly in the newer States and in the distant territories; and there is not much probability that these supplies will, in future, meet the wants of the older States. The transportation of timber is too costly for delivery at great distances, especially eastward, toward which the heaviest amount of freight is drifting. The wants of the regions in which this timber grows are urgent, and their mining interests will require large quantities of timber and charcoal, while there is no end to their wants of wood for building, for fuel, and for an infinite number of other purposes, not the least of which is the making and maintenance of railroads.

It is well known that trespass and plunder have been, and are now, the order of the day, with respect to the timber upon the public lands. The sentiment upon the frontiers so strongly favors the practice of taking timber for private uses wherever it can be found, that a conviction can scarcely be obtained before a jury upon the plainest evidence; and the efforts of Government in restraining this plunder have scarcely succeeded any-where, beyond now and then a compromise, with or without the after-payment of damages.

I have been through many of these regions, where considerable tracts of woodland still remain upon the public lands, and where this spoliation is going on. Those engaged in it, will frankly admit that the present lawless custom is a bad one, and that they would much prefer one giving them the protection of the law upon payment of a reasonable price. They could then adopt measures for preventing this waste, and could manage their rights so as to prolong the supply.

(*To be continued.*)

MISCELLANY.

Extract of a letter from Prof. Lawrence Johnson, of Holly Springs, Mississippi.—*The "Red Gum."*—This is not a distinct species, but the old trees of the common Sweet Gum, of which there is but one genus in the United States (*Liquidambar styraciflua*). It is a common growth on all the bottom lands of the South. The old trees often attain a great height and girth. I have often seen them six feet in diameter and a few larger. The most of this will consist of heart or *red-wood*. Young trees even of large size are often found *white* throughout.

It has long been used as lumber in those sections deficient in Pine. Before railroads made the southern Pine so accessible, *Gum* and Poplar were the favorite trees for timber; Poplar for inside and light work, and *Red-Gum* for well-curbing and weather-boarding. Much Red-Gum can be still seen forming walls of old buildings in Tennessee, Arkansas, and Northern Mississippi.

Before railroads gave northern mechanics possession of all the manufacture of furniture, local mechanics furnished much of the heavy articles, such as bureaus, bedsteads, tables, sofas, etc., of this timber. Red-Gum and Cherry are very much alike, and the latter being very scarce the former every-where became the substitute. It has been considered second only to Walnut in esteem and price; and is yet so held as to choice kinds and portions of the trees.

It is quite firm, not quite so hard as Cherry, nor nearly so much as Walnut, but takes quite a good polish; is not as beautiful in its knots as Walnut and Mahogany, but again is not as liable to warp or crack. In these last particulars, no timber in the world, except Pine, can compare with it. It is specially adapted for carving, being freer from liability to to crack than any except box, though much softer.

By judicious cross-sawing of knots, with oil-finish, carvings, etc., it can be made closely to resemble the finest Mahogany. It is easier to work, and at the same time stronger than it or Walnut. The latter, however, is the *fashion*, and it will take some accident or caprice of this fickle goddess to introduce this *finer* rival.

The Ohio State Forestry Association.—We are pleased to announce that a State Forestry Association has been formed in Ohio,—it being one of the results of the discussion something more than a year ago, which led to the Convention at Cincinnati in April last, and to the organization of the AMERICAN FORESTRY CONGRESS.

It appears that the citizens of Cincinnati were not satisfied with giving origin, and a vigorous impulse to the national, or rather international society, which may already be counted among the most efficient agencies of the country for concentrating and directing public opinion upon the subject of Forestry. They wanted something nearer home—with more frequent meetings, and more direct communication with the people of their own state, and so they organized Weekly Meetings at the Gibson House in Cincinnati, and in January last, formed a State Society, with the following

CONSTITUTION.

ARTICLE I. This society shall be known as the Ohio State Forestry Association.

ART. II. The object of this association shall be to encourage the protection and planting of forest and ornamental trees and to promote forest-culture.

Art. III. Any person may become a member, as provided by the by-laws, upon the payment of two dollars, which shall include the dues to the annual meeting of the January following.

Art. IV. The seat of this society and its place of business shall be at the city of Cincinnati. The association may have a branch in every county of the State of Ohio, and the president of any such branch shall be, ex officio, a member of this association.

Art. V. The officers of this association shall consist of an Honorary President, an Acting President, three Vice-Presidents, a Secretary, a Treasurer, and eight Directors. All said officers shall constitute the Board of Directors, and be elected annually, and hold their offices for one year, or until their successors shall have been elected and duly qualified.

Art. VI. There shall be one annual meeting, which shall be held at such time and place as the Board of Directors may determine.

Art. VII. The Board of Directors shall meet on the second Thursday of January, April, July, and October. The President may call such special meetings of the Board and of the association as necessity may require.

Art. VIII. This Constitution may be amended by a two-thirds vote of the members present at the respective meetings of the association, thirty days' notice in writing of such proposed amendment to be given to every member by the Secretary.

BY-LAWS.

First. Application for membership must be made through the Board of Directors. Two negative votes of members present will bar from membership.

Second. Any member shall cease to be such by neglecting to pay his annual dues for two successive years.

Third. No member in arrears with his dues shall be eligible to vote, nor shall he serve on any committee, nor wear the badge of the association.

Fourth. The annual dues shall be one dollar, payable in the month of January in advance.

Fifth. All money due the association shall be paid to the Secretary, who shall pay the same to the Treasurer, taking his receipt for the same.

Sixth. Any member may be expelled from the association by the Board of Directors for disreputable conduct both inside and outside of the meeting.

The following officers were elected:

Honorary President.—Dr. John A. Warder.

President.—Judge Warren Higley.

Vice-Presidents.—Gen. Durbin Ward, Hon. Chas. Reemelin, and Hon. Horace Wilson, of Columbus.

Secretary.—Adolph Leue.

Treasurer.—John H. McMakin.

Directors.—John Simpkinson, Dr. A. E. Heighway, Hon. Emil Rothe, Frank Pentland, John B. Peaslee, A. Strauch, Gen. E F. Noyes, Col. A. E. Jones.

At the meeting when this constitution was adopted, Col. A. E. Jones reported that out of the three hundred and twenty trees planted on Memorial Day in Eden Park last April, only twelve had died, and he had replaced them with other trees taken from the park by authority of the Board of Public Works, and with trees imported from Germany. The Colonel suggested that the various groves of trees in the park should be designated by stones with the names of those in whose memory the trees had been planted.

Superintendent Peaslee said that he had taken steps to designate the trees planted in the authors' group by cutting the names in stone, and he would publish the same in his next annual school report.

Colonel Jones was appointed a committee of one to prepare plans and report the probable cost of furnishing stones to designate such trees as are not already marked.

President Higley read an interesting paper upon the necessity of tree-culture, especially along the lines of railroads, and recommended that the State Legislature should provide for the appointment of a State Forester.

A committee consisting of President Higley, General Durbin Ward, and Emil Rothe was appointed to draft a bill to be presented to the Legislature for the encouragement of forest tree culture.

The President was authorized to appoint a committee of five to report preliminary arrangements for celebrating Arbor Day, which occurs in April.

Among other letters received from persons expressing an interest in this movement, was the following, from the Hon. Cassius M. Clay, who took an active interest in the first meeting of the American Forestry Congress in April, 1882:

"White Hall, Ky., Jan. 9.—*Dear Sir:* Your favor of the 6th inst. informing me of the meeting of gentlemen of science and public spirit in Cincinnati with a view of forming a State Society of Forestry of Ohio is received. You also ask my moral support in furtherance of so interesting an event.

"I am well convinced that the people of America have been thoughtless and wasteful in the destruction of our native forests; and the result we begin to feel, a want of wood and timber and the diminished rainfall, the drying up of streams, springs and lakes, and consequent drouth affecting the growth of crops.

"The evaporation of the tropical seas is a fixed quantity, but it does not follow that the same amount of rain falls in the old sites as when the forests were untouched by the ax. The clouds charged with rain passing over arid plains are not relieved of their moisture, and it is either dissipated into distant space or precipitated in far off mountains. But should we yield so far to our opponents who contend that the rain-fall remains the same in each year, one thing is beyond controversy, that the waste of forests makes unusual distribution of the time of its falling, and what does fall is hurried off at once into rivers and seas, and severe drouths are the result. I have lived long enough to know this of my own experience, to which I refer you in a paper prepared too late for the last Forestry convention in Cincinnati, and which is held by my distinguished friend Dr. Warder.

"What we want now is to arouse public notice to the facts, and to create societies in the several States to act under the patronage and aid of the several States and all concentrating their experience in the National Bureau of Forestry which can unite with foreign societies and governments and make all knowledge on this subject of world-wide usefulness. For it is not too much to say that nations have owed their rise and fall to these laws of tree growth and rainfall, and that our own nation can not live and ignore them.

"I have, like the most of you, no personal interest in these matters, and it remains for those noble spirits who make the whole race their one family to labor in this great cause, receiving the sweet reward and the pleasures of a philanthropic life.

"Assure the committee of my appreciation of the compliment paid me in giving me notice of their movement and the assurance of my every possible co-operation. I am, sir, with great respect yours and their humble servant. C. M. CLAY."

One of the first things undertaken, was a united effort to secure State legislation in aid of forest culture, and a committee consisting of Judge Warren Higley, Gen. Durbin Ward, and Hon. Emil Rothe, to whom the subject was referred, submitted early in February, the draft of a bill to be presented to the Legislature, as follows:

AN ACT TO ENCOURAGE FOREST CULTURE IN THE STATE.

"SECTION 1. Any inhabitant liable to road tax, who shall plant by the side of any public highway any forest shade trees, poplar and willow trees excepted, or any fruit trees of suitable size, shall be allowed by the supervisor of the road district in which he resides, in abatement of his road tax, $1 for every four trees set out, but no row of Elm trees shall be placed nearer each other than fifty feet; no row of Maples or other forest trees nearer each other than forty feet, except Locusts, which may be set thirty feet apart, and no fruit trees shall be set nearer each other than thirty feet. No allowance, as before mentioned, shall be made unless such trees shall have been set out at least one year previous to the demand of the said abatement of tax, and are living (tied to a pole), and well protected from animals at the time of such demand, and provided that the supervisors of the respective road districts shall have authority to make regulations as to the kind of trees to be planted, and as to the manner of setting them out, in regard to the symmetrical or ornamental arrangement of the rows of trees so planted. Any trees replanted by the side of public highways, as aforesaid, in the place of trees which have died, shall be allowed for in the same manner and under the same conditions as in the preceding section.

SEC. 2. No person shall be allowed an abatement of his road taxes, as aforesaid, more than one-third of his annual road tax, and no one shall receive any abatement of road tax for trees planted previous to the passage of this act.

SEC. 3. Any freeholder in theState of Ohio who shall plant or sow in and keep stocked with any kind of forest-trees, any tract of land not less than ten acres, and any incorporated company which shall plant or sow in with any kind of forest trees, any tract of land not less than one hundred acres, and shall actually convert such lands into forests, and keep them under regular forest culture for a period of five years, shall upon satisfactory proof to the Auditor of State that these provisions have been complied with, pay out of the treasury of the State of Ohio, to such freeholder or company, or their assigns, a sum of money equal to all State and county taxes assessed and actually paid on such lands during the said five years; but no such payment shall be made for any lands planted or sown previous to the passage of this act. This section shall not apply to nurseries sown or planted to raise young trees to be sold for transplanting.

SEC. 4. For the encouragement of tree-planting the fourth Friday of April in each year shall be designated as "Arbor Day," and the teachers employed in the common schools may dismiss their schools on this day without forfeiture of pay, provided such teachers and pupils shall take part in tree planting.

SEC. 5. The Governor shall, by and with the consent of the Senate, appoint a State Forester, who shall hold his office for three years. He shall have an office in the State House which shall be a bureau of all statistics and matters pertaining to Forestry. He shall have the general supervision of the planting and of all lands in the State under forest culture and culture of trees on the public highways, make an annual report to the Legislature of Forestry matters within the State, and deliver annually a course of not less than twelve lectures on subjects pertaining to Forestry before the students of not less than two educational institutions in the State, to be designated by the Senate. For his services he shall receive an annual salary of $3,000."

Some verbal alterations and additions were made by the committee, but the substance remains as above.

There was some objection to the clause making the State Forester a salaried officer, but with the explanation that the Legislature would probably modify and change the bill in several parts the objection was not urged, and the bill was adopted.

Superintendent John B. Peaslee, chairman of the committee on Arbor Day, reported the following as the order of exercises:

Your committee on Arbor Day have decided to hold the Arbor Day celebration in Eden Park, the exercises to consist of the ceremony of marking the trees in the several groves—pioneer, citizens', memorial, presidents', battle, and authors'; in planting trees in places of those that have died during the past year; in planting trees in memory of distinguished citizens who have died since the celebration last year—trees to Rev. Dr. Lilienthal, Dr. Mussey, Hon. Wm. T. Forrest, Dr. Foster, Professor Borger, and others whom this association may name.

The exercises in the park will conclude with speaking, reading essays and poems, and singing and instrumental music. I desire to say that one choral society has already volunteered to sing.

The following committees were appointed: On speakers, Professor Adolph Strauch, Professor Leué, and J. H. McMakin; finance, Hon. Leopold Burckhardt, chairman, the remaining members to be announced; decoration, Colonel A. E. Jones, chairman. Mr. John Simpkinson was appointed to see the Board of Public Works.

The committee also decided to prepare a brief circular to the trustees and circulars of the schools of the State, asking them to instruct the pupils under their charge on the subject of trees, their importance, use, value, etc., and to devote one day, April 27, to the planting of trees.

Also, a committee on planting a group of trees in honor of the Tharandt Forest Academy, Saxony. This famous institution planted a grove of 100 trees of the *Catalpa speciosa*, which were sent them by Professor Leué. The trees were planted by the Academy on our Arbor Day, April 27, 1882, and named Cincinnati Arbor Grove. Professor Leué was appointed chairman of the committee.

The report was accepted and the committee continued.

Professor Leué offered a resolution that a committee be appointed to take into consideration the propriety of calling a Forestry convention under the auspices of the State Forestry Association to meet in Cincinnati on Arbor Day, April 27. The resolution was adopted and the President appointed as such committee Professor Leué, John Simpkinson, Dr. Heighway, Dr. Warder, and Judge Rothe.

Professor Leué presented a design for an emblem of the Association, and asked for some action in the matter. The design consists of an upraised arm, the hand of which holds an ax, the descending stroke being arrested by another hand grasping the wrist of the uplifted arm, surrounded by a wreath of oak and maple leaves. Above the design is the name of the association; below the words, "Woodman, spare thy stroke." The subject was referred to a committee. Dr. Warder suggested that the leaves on the emblem be made to resemble something that has an existence. At the Forestry Congress a design printed on the flags contained an acorn of one species attached to a leaf of another variety.

Dr. Warder gave a brief lecture on the subject selected at a previous meeting.

It was decided to meet hereafter every two weeks, instead of weekly. The various committees will meet next Saturday at the Gibson House.

Hon. Emil Rothe will read a paper at the next meeting of the association on a subject of his own selection.

The Indian Forester: a Monthly Magazine of Forestry. Edited by W. R. Fisher, B.A., Deputy Director, Forest School, Dehra Dun. This Journal having run through eight years as a quarterly, makes its first appearance in monthly form in January, 1883, being of about the same size as this JOURNAL. It is published at Roorkee, at six rupees a year to Forest officers under the rank of Assistant Conservator, and twice this sum to other subscribers.

In a friendly notice of the AMERICAN JOURNAL OF FORESTRY, it expresses hearty sympathy with the movement in favor of Forest Conservancy in the United States and Canada, and says:

> "Dr. Hough, Chief of the Forestry Division, United States Department of Agriculture, and author of a book on Forestry, (a notice of which will shortly appear in our pages), is the Editor, and we hope he will be able to do for America what Mr. Brandis has done for India, that is to lay deep and broad foundations of Forest Conservancy.
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> "With a popular and decentralized Government, and with most of the State lands in private hands, it will be a most difficult task. . . . Although vast areas of forest land have been worked over, it must not be supposed that the young growth has everywhere been destroyed, though we do read of ruined forests which are well described in the following extract from Mr. E. F. Smith's *Flora of Michigan.*
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> "The valuable trees were felled years ago, and the lumberman moved on to fresh spoils, leaving behind an inextricably confused mass of tree-tops, broken logs, and upturned trunks. Blackberry canes spring up everywhere, forming a tangled thicket, and a few scattering poplars, birches, and cherries serve for arboreal life, above which tower the dead pines, bleached in the weather and blackened by fire, destitute of limbs, and looking at a distance, not unlike the masts of some great harbor. Thousands of such acres, repellant alike to the botanist and settler, can be seen in any of our northern counties."

Referring to the first paragraph in the above extract, we can at present only say, that there are obstacles in the way of progress, of which at present we can not speak, *but which will in due time be fully made known;*—for they belong inseparably to the history of Forestry in the United States.

The duty of the government with respect to the management of the timber upon its public lands, the modes by which it might and should promote an interest in the subject, and some of the ways in which this might be done by State governments are stated somewhat in detail, in our Third Report upon Forestry, to which reference may be made by those who take an interest in these inquiries. The Forty-seventh Congress, at the last moment, passed a concurrent resolution, for printing an extra edition of 8,000 copies of this report, and those making timely application to a member of the House, or to a Senator, will doubless be able to secure one.

The Re-afforesting of Ireland. The February number of the English "*Journal of Forestry*" has a very excellent article upon this subject by Dr. Lyons, M.P., which deserves our notice. After speaking of the historical evidences that Irland was once a forest-region, and the political and other causes that operated in its clearing, he proceeds to notice the measures that have been recommended in more recent years for the improvement of waste lands, more particularly by planting.

In 1849, Lord John Russell brought a bill to expend £1,000,000 on the improvement of lands, which was withdrawn on the understanding that the owners would employ State loans through the Board of Works for reclamation. It is hardly necessary to say that nothing was done. Afterwards, and down to 1881, other measures have been brought forward, but nothing has actually been done, under government, to the present time.

As to the condition, it may be stated that Ireland had some 20,330,000 acres in all, of which about 12,000,000 are in grass, 3,000,000 under tillage, and the remainder is waste. The legislation proposed in modern times, has been chiefly permissive in its character, and for this reason we need not be surprised that it has failed. The country had for a long time been left dependant upon importation for its timbers, until this had come to be an inevitable necessity. Of the conditions and the necessities of the case this writer says:

"The tradition which has kept alive for so long a time the memory of timber as a natural growth of Ireland, became more and more dim. The knowledge of the resources of Ireland, the capacity as well as the desire to utilize and restore her industries, became fainter and fainter, until it became generally accepted, both in England and Ireland, that the latter was a naturally poor, thriftless, and aimless population; and both rulers and people, with a rare exception now and then, regarded all attempts to develop the the latent resources of the country as but dreams, no doubt beneficent, but wholly beyond the scope of an age which prided itself in being eminently practical. A good-natured wish, with something between a sneer and a smile, is accorded to any one who desires to restore an industry once known by a few to have flourished abundantly, but the history of which is unknown to the rigid economist, who as ignorantly as arrogantly sets aside with contempt, any effort to direct energy into channels long unused. In the words of Sir Richard Temple, 'Forestry, recollect, is a subject comparatively novel. A few years ago it was but little understood, and even now you well know, as practical men, that a great deal has to be learned by us all, and more especially by the governing classes.' These words, used in regard to Indian Forestry, apply in an especial manner to the state of things in Ireland. We want men of the greatness of mind of Lord Dalhousie, and of the practical energy of John Mair Laird, (Lord Lawrence of the Punjaub), to take up and to prosecute this work in Ireland. With the examples of what the Government of this Empire has done in India, and is now doing on a small scale in the Isle of Man; with what all the chief European countries—France, Germany, Austria, Italy, Switzerland, Denmark, Norway, and Sweden—are doing, as our consular reports fully prove; with the destruction in ten years of 12,000,000 of acres of American Forests, once supposed to be illimitable and inexhaustible; with the known facts as to the deterioration of climate, increased dampness, and diminished earth-temperature of the soil of Ireland; with the consequent and well recognized diminution in the products of the soil by tillage, and of her grass lands under dairy farms; with the silting up of her streams, by the ruinous waste of her most nutrient of mountain declevities; with the gradual choking from the same cause of the main and secondary arterial drainage carried out some forty years ago with great expenditure, now rendered all but useless, it is only a question of time and of energetic action on the part of those who understand the practical problems involved, how long it will take to overcome the *crassa ignorantia* of our rulers in Ireland, and to force them, or those who are to succeed them, by an enlightened public opinion, to take up a work now recognized in all civilized countries as both useful and necessary. . . . Now that the problem of re-afforesting in Ireland has for the first time assumed practical proportions, being recognized unanimously by all classes in Ireland as a question of prime importance, it remains to be seen how the government is prepared to deal with it. From an impartial point of view it can not for one instant be questioned—by any one at all competent to speak on the subject, in view of the probability of a timber-famine within measurable distance of us, say within twenty-five years,—that the re-afforesting of Ireland, once so fruitful in timber of the highest class, is for all practical purposes, a question of pressing, of great, indeed of Imperial importance.

Vermont Forestry Commission. On the 25th of November, 1882, the Legislature of Vermont passed the following joint resolution in reference to the forests of that State:

"It is hereby resolved by the Senate and House of Representatives that the Governor shall appoint three Commissioners to inquire into the subject of the forests of Vermont, as to their extent and condition, and what if any measures should be taken in respect to their protection, and report the same at the next session of the Legislature. The expenses of such Commissioner to be paid by the State shall not exceed three hundred dollars."

Under this authority the Governor has appointed the Hon. Edward J. Phelps, of Burlington, Redfield Proctor, of ——, and Frederick Billings, of Woodstock. At the time of our latest information this commission had held one meeting in New York, and there is every reason to hope that efficient measures will be recommended.

The Rio News, a Brazillian paper in the English language, in a friendly notice of this JOURNAL, given in its issue of Jan. 27, last, says:

"In the United States, where the destruction of forests is going on at an alarming rate, the special subject to which this magazine is devoted is one of the greatest importance. Throughout a large part of Brazil, as in the northern provinces of Ceará, Piauhy, Rio Grande do Norte, etc., and in the interior districts of Bahia and Pernambuco, it is a subject which deserves equally close attention. We might add also a good part of São Paulo, and extensive districts in the southern provinces, where tree-culture is a matter of high importance. This new periodical—and it is No. 1 of Vol. I. which we have before us—is one that recommends itself to a wide circle of interested readers, not only in the United States, but throughout the whole world."

Forest Legislation in New York. The Legislature of this State has recently passed a law directing that no more wild lands be sold in the region known as the Adirondack Wilderness. This measure was recommended in the first report of the Park Commission in 1873, and it would have been well had this been sooner done. On a future occasion we shall notice in detail some questions involved in this measure.

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AMERICAN
JOURNAL OF FORESTRY.

MAY, 1883.

FOREST TREE-PLANTING:—THE RESULTS AND ADVANTAGES TO FARMERS.

By B. GOTT, of Arkona, Ontario.

[With the fact before us, that all the land in most the older and in many of the newer States, as well as throughout the settled parts of Canada, has passed into the hands of private owners, leaving the subject of clearing or of planting wholly at the discretion of these owners, it appears to us plainly evident, that the farmers of America have an immense responsibility thrown upon them, with respect to the maintenance and renewal of our woodlands, for the direct and incidental advantages that we may expect to derive from them. Every motive and argument that can in any degree fix public attention to this fact has our sympathy to its fullest extent, and beleiving that the following paper will tend to this effect, we give it a place in the Journal, it having previously appeared in the *Weekly Toronto Globe* of March 9th last.—Editor.]

I AM pleased by the propounding of this interesting question for discussion, though it be ever so humbly done. The idea of the planting of trees and the equally interesting idea of results and advantages to farmers are so prepossessing to our minds that they at once elicit our most devout respect. Advantageous to farmers! How can any thing be advantageous to them that is not equally so to the great mass of the community? Is not the welfare of the whole of society identified with that of the farmers? We assume, therefore, that whatever is an advantage and a blessing to the farmer is important and essential to the interests of all other men. Let us hail, then, with supreme delight any means or any course of conduct that promises results and advantages to the farmer. Away with that miserable, narrow, and ungentlemanly feeling that would deprive a farmer of pleasure and advantages simply because he is a farmer! Such a sentiment as this can not possibly live in the clear and glowing sunlight of our blessed civilization. It can only live in the darkness of ignorance. In looking at the question of tree-planting, I can scarcely conceive of it as a question of advantage or of disadvantage. To my conception it is rather a question of position, and felt need, and not something that we may or may not do as we see fit, but something that is forced upon us as a necessity of the times in which we live. Tree-planting must be done on a large plan and systematically, if we would enjoy the fruits of our fields and orchards and the quiet of our peaceful homes. A glance at the condition of wretchedness and want, of deforested China and Japan, which have in times past so wantonly destroyed their rich inheritance of forest wealth, is enough to make us tremble at the mere prospect of the like befalling our homes and our fair fields. Let us be armed in time to evade these calamities! What, we may ask, is becoming of the once famous, unmeasured, and boundless forests of Canada? Are they not fast disappearing? What are we who are reaping these harvests of wealth trying to do to replace the fine old trees for future generations? Where are our acres of young and thriving forest trees? Our beautiful and defensive belts of trees along our highways and around our orchards and our fields, and around our homes? I know it is difficult to find them, and that we are not doing our duty in this matter to those who are to succeed us.

Let us then as briefly as possible consider the best way to commence the business of tree-planting. When we are convinced of our duty to plant trees, the first thing we must certainly want before any decided steps can be taken, is a supply of young trees to plant. A want of these has deterred many a good man from planting trees at all, who otherwise would have done so. To overcome this difficulty a little timely forethought is necessary. The seeds of our forest trees fall plentifully around us, and we can have them merely for the gathering up. The seeds, if properly secured in mother earth, will produce for us all the young trees that we may need, whenever we feel our better nature prompting us to plant. It is calculated that 100 feet square of good land covered with the seeds will produce enough of young trees to plant 100 acres! Only think how prolific in her returns kind nature is to us. When her capabilities are properly husbanded for our interests, we are perfectly astonished. "These tree seedlings" planted out in well-prepared ground, 4 by 4 feet, or 2,722 trees to the acre, would soon grow up to be a sight of beauty to our country and a source of wealth to the cultivator and fortunate possessor. Suppose a few acres, say 10 acres of each of our 100-acre farms, was devoted to trees, even at this rate of planting, what a magnificent growth of fine young timber—just what the country needs—might soon be produced. A belt of trees standing one rod apart round each of our 100 acres lots, would contain 560 specimens, to be an ornament to the inheritance and to bless the hand of the provident planter. Prof. Brown, of the Agricultural College, Guelph, has shown, that in our country the prevailing winds that bring rain are from the southwest to the northeast. According to this showing, it is clearly our duty to plant belts of trees along the north and west sides of our lots to obstruct the fierce winds, and to attract the moisture they may contain. The plantings may be in the following order:—First, a row of Maples, or Basswood, or Elms four feet from the line and one rod apart; secondly, ten feet from this row may be planted a row of Scotch or Austrian Pine, and one rod apart; thirdly, ten or fifteen feet from this row may be planted a row of Norway or Black Spruce, so that they will intercept the spaces in the Pine row. If it is thought best to fill up the spaces between these plantings as early as possible, low-growing shrubbery may be planted in among them. This will make a useful and a beautiful belt, and while it is growing up and coming into service will be increasing in beauty and efficiency every year. The system of hedge-planting is also another way in which tree-planting may be made very useful and very beautiful. For this purpose the best sorts of trees to use may be either Buckthorn, or Honey Locust, or Barberry, each being well known as the best hedge plants known in our climate and conditions. For low, damp, or swampy lands, or even for rough, stony, and uncultivable lands, the planting of trees for coppices is a most profitable exercise, and will well repay any amount of care bestowed upon it. The timber for those purposes must be those that will readily sprout again from the bottom after being cut off, as Basswood, or Ash, or Elm, and some of the Oaks. Surely there is enough said in this short sketch to interest any man of ordinary attainments in the matter of tree-planting. But should any further inducements be required, and as we are a matter-of-fact sort of people, I will attempt to show the results and advantages.

Here let me say that in the very limited space at my command, I scarcely know how to do any thing like justice to the following important propositions, as each of them are ample and full for a theme in themselves. They are each of them big with fine practical truths and lessons in themselves, so that if I should attempt to open up with any degree of fullness, I would require more space than I have allotted to my whole subject. Suffice therefore with mere suggestions of the advantages of tree-planting on our farms.

First. The ornamentation of the farm. I feel confident that I am addressing myself to an intelligent and appreciative class of men, who will be willing to admit this idea for its full value to them on their farms. You know that your farms are worth more for your efforts at improving and beautifying them, not only for to market, but also for your own personal use. You know that they will sell readier, and that they will bring you more money when sold, for the beautiful trees that are planted upon them. You yourself would not take much money to have those trees removed that your own hands have planted and you have watched with care. In all our sterner thoughts of life, we can not afford to altogether ignore the beautiful in nature and the beautiful in art. To you "A thing of beauty is a joy forever" as well as to the rest of humanity who are even now panting for the beautiful. Again, "Life without beauty is a dead and unwholesome thing;" and again, "Trees are fit to minister to man's manly sense of beauty." These are the modern expressions of the deep and hidden sense of the beautiful lying under our sterner natures, and and which are so successfully ministered to by the grand and majestic beauty of the living plant or tree. The man who could pitch the dwelling designed for the abode and resting-place of his family in a drear and open field, treeless and flowerless, is a long way behind the æsthetics of the age, if he is content to leave it so. He has spent the foregoing part of his life for nothing, and has yet every thing to learn respecting the beauty of this life. We know that men are alive to their best interests, and that they must and will plant trees around their farms and their homes for beauty and for use. Everywhere we see encouraging examples of movement in this direction, and much may they be extended!

Second. Trees are the homes and meeting places for the birds. Every farmer in our vast domain will at once see and recognize the force of this proposition. Birds are the children of the air, and lodge among the branches of our trees. If there are no trees with their wealth of beautiful branches on our place, we can have no birds. If there are no birds, there is no restraint upon the millions of devouring insects that are ever ready to prey upon the crops that the honest farmer needs for his bread and his money. So the relation between tree-planting and the farmer's pocket is established, and is intimately close—closer, indeed, than some of us are aware of. Let us remember that most of the small and beautiful birds that warble among the branches of our trees are insect-eating birds, and are our most intimate and devoted friends, ever working for our interets. Let us encourage them and their friendly efforts for our good in every possible way by planting trees for their convenience. The tree and the bird! How astonishingly beautiful these organized objects of kind nature are in their life and their work! Each of them are grand conceptions of infinite wisdom, and are worthy of our attention and careful study that would fill volumes of scientific and useful teaching. The tree and the bird! How intimately close is the relationship that exists between the departments of the natural world, between the vegetable and the animal kingdoms. Between the merest vegetable and the highly organized beauty of the air. This relationship is easily traced, the one ministering to the daily requirements of the other. Would we have birds to cheer and to bless us, let us plant liberally the trees they love.

Third. The economics of the farm require trees planted. I am sure there is no farmer but will readily appreciate the statement and will immediately pluck up his ears at the mention of it. By the economies of the farm, however, I do not mean the discussion of the most advantageous ways of feeding stock, or the best breeds of horses, cattle, sheep, etc., to keep for profit, but rather what are we going to do with those waste lands on our farms that are too wet and mucky to be used for the culture of grain, or that are too rough and stony to admit the plow? These are questions of much importance to us, because every acre of our farms has to be paid for, and every acre is liable for taxation; and consequently we of all men can ill afford to allow any of it to lie idle. We want it all to bring in something, and something that is useful to us. We advise you to plant the low mucky places with Canadian Larch, or with Black Ash, or with Elm or Willow; and besides turning a dismal swamp into a field of beauty, it will soon be a source of great profit to its owner. The thousands of acres of rough, stony, and useless land of this country should be planted as early as possible, though in ever so rough a way, with young seedlings of Oak, Maple, or even Black Walnut. It would soon astonish the most incredulous to see the quantity and suddenness of the growth and profits arising from these discarded eye-sores of the farm. Farmers of our country, awake to your best interests! Allow no stagnant miasma holes or useless eye-sores on your place to destroy the symmetry and beauty of your lovely farms. Plant them with trees, so shall they be to you objects of pride and satisfaction, and blessings to your country.

Fourth. The healthfulness of the farm. At first sight you may perhaps think that now you have me, for since the farm has been cleaned up of its trees you have never once had an attack of ague and fever in yourself or your family. But stop, my friend, and consider for one moment. The trees on your place were not wholly responsible for those cruel attacks of shaking ague and still more dreaded fever. It was rather your sudden onslaught on the enormous crops of vegetation every-where around you that caused it. Cleaning away the timber, letting in the sunlight, and the resultant decay of vegetable matter every-where that filled the air with germs of disease, and you took it freely into your system until it almost shook the dear life out of you. Let not the recollection of this dishearten you in your efforts at planting trees, for they are a source of healthfulness and blessing. We say in all candor, plant them on the farm and town lot for healthfulness. It is well known that trees in their growing action, absorb in large quantities of gases from the earth and from the air. These gases for the most part are effete animal exhalations that have served a purpose, but are now given off from our bodies as useless and worse than useless to us. These gases are the very life of the trees, and are absorbed by them in large quantities. Again, the trees give off gases that are useless to them, and these gases are the very food of our life. Only think of an arrangement like this in the infinitely wise economies of nature! The vegetable and the animal—the one mutually dependent upon the other, the lower form living for the higher, and neither of them living for itself. We have thought that a small but wild plantation of trees as a coppice on the lower end of each town and village lot would be the very best advice that could be given by our boards of health. How much effete and decaying vegetable matter is recklessly thrown out in the back yards of all our town lots, and left to decay and poison the atmosphere we are hourly breathing for our life?

Its deadly influences are sometimes felt by us and the dear ones of our family circle when attacked with the various forms of acute inflammations or with typhoid fever, and the more dreadful diphtheria. A coppice of wild trees, interlaced with wild vines and creepers, just at the lower end of the lot, would be a calm retreat from the scorching heat, and a reservoir to utilize all the poisons and pestilences of the atmosphere. How simple the remedy, and yet we are paying the debt of our negligence of the specifics of nature. Blocks of trees and belts of trees on the farm would answer the same purposes, and be an everlasting fund of satisfaction and pure enjoyment. Farmers, let us plant trees for healthfulness for ourselves and our families, for what are all the wealth of your coffers of gold compared with the unspeakable blessing of health?

Fifth. The modification of temperture. It is very generally admitted that trees have the power of absorbing and storing up latent heat, and again giving it out in times of extreme cold. If this is so, and we fully believe it is, how fine is the modifying influence that may be exerted on our climate in its depressing moods? Again, it is believed that the tree has the power of the absorption of moisture, and in a time of severe drouth again giving it out liberally through its trunk and its branches and leaves in the summer time. This influence ascribed to the tree has the effect of cooling and moistening our dry atmosphere during the heated term. This view presents the tree as an enormous laboratory, utilizing heat and dispensing coolness and moisture to correct the extremes of our seasons. By the simple means of their agency the extremes of temperature endured in every treeless region may be corrected. But further, we have sometimes thought, while sitting under our spreading Beech trees, in the intense heat of summer, that there was always a cooling breeze there, and consequently that they were attractive to coolness and breeze. Have you not many times been struck with the same idea?

If we had the space at our command we would like much to enlage here on the subject of wind-breaks and storm-stayers, etc., in relation to trees. We are more than certain that the agency of trees is the most efficient and effectual wind-breaker that can be adopted. We are almost as certain that the same gentle influence may be credited with the cooling and refreshing moisture of many a summer shower that visits our plantations. When shall we arrive at a correct understanding of the great laws of nature, and the governing forces of the world? When shall we learn the proper relationship of one part to another in the arrangements of nature? How can we have the blessings of a fertile and fruitful country without the agency of trees?

Sixth. The distribution of electric fluids in the air. The subject of electricity is a mysterious question that we can not fully understand. Yet we know that the vast treeless plains of our continent are frequently visited with those destructive influences of the deadly lightning bolt. The great prairies of the West are annually visited by these alarming displays of nature, to their serious loss and the discomfiture of the people. In tree-growing regions these displays are less frequent and less severe. Our advise, therefore, is to plant trees around your fields and around your dwellings to ward off the influence of destructive lightning.

Seventh. Trees furnish a friendly shade and cooling breezes for the farmer's children and his cattle. As we have already anticipated this item to some extent, we will here simply say that for this use alone trees will pay far more than they cost. Is it nothing to you that your children have not the cooling shade of the spreading Beech tree or the more emblematic Maple, under whose spreading branches to enjoy their healthy sports at mid-day in the height of our heated season? Is it nothing to you that your cattle of pure blood, your horses of noble ancestry, and your sheep of fine clip are left out standing in the melting heat in a friendly fence corner, and without the grateful shade of one spreading branch over their defenseless heads? Oh, I kow you count your interests better than this, and though you would not for your children, yet for your horses, cattle and sheep you will provide the grateful shade that blesses them in the burning noonday.

Eighth. Trees supply timber, poles, and brush for the use of the farm. "Oh!" you say; "this is a glaring statement. It will take years upon years after I am old to grow timber, etc., for the use of the farm from these trees, and we will never see any benefit from the trees we plant!" Stay, my friend, this is entirely a false impression, and one not supported by the facts. A gentleman, in a paper read at the late Forestry Convention at Montreal, stated that Catalpa trees can be profitably planted as close as four by six feet, and at the end of ten years from planting one-quarter of them can be taken, and will each make two fence posts valued at ten cents each. We know from our own experience that trees planted on good soil and doing well for this length of time will come into considerable usefulness, especially for poles and brush for the farm. In passing through the county of Prince Edward a short time ago, we were amazed at the size and beauty of their fine trees planted on the roadside. These trees, mostly our beautiful Sugar Maples, could not have been planted many years, and yet they were from twelve to twenty inches through at the bottom, and were fine spreading, handsome trees, and an ornament to any country. Be not, therefore, so easily discouraged. Kind nature is generous of any assistance given her, and what can be done in this county can also be done in any county in Canada. Plant trees, therefore, as nature can do nothing for the man who will not help himself. If you help her she will reward you with the proudest and most satisfactory results to crown your feeble efforts. Try it!

Ninth. Trees are an encouragement to rainfall and water supply. This is now become a settled principle in the creed of understanding tree planters, and our observation teaches us that it is correct. It is authoritatively stated that through trackless regions of the Muskoka district rainfall and water supply are abundant and pleutiful, and solely on account of its dense forest growth. This is in exact keeping with our past experiences in Western Canada, as we all quite well recollect. Is it so with us now? Where are the flowing streams that were once flush? Where are the bubbling springs bursting forth from every hill and flowing across our pathway? I know you will look for them in vain, for they are dried up and their sources are emptied. Again, it is stated that the region of country lying between Lake Ontario and Georgian Bay is especially left to welter in its intense summer drouths, and mostly on account of rapid clearing of the country.

Trees, by means of their influence on the atmosphere, increase the amount of condensation of moisture and precipitation. Again, by means of their roots and their action on the soil, they check the force and injury of torrents, and by rendering the ground porous and open largely drink it in, to be given out again when and where most needed. But again, forests, by means of their abundant foliage, evaporate or throw off enormous quantities of moisture into the air, and this, after being carried about by the winds, is condensed by the coolness of evening, and falls plentifully upon the neighboring country in the form of pearly dew. So the action of the trees and the reaction of the atmosphere is constantly going on, and every time man receives blessings by the mysterious arrangement. Plant trees for moisture.

Tenth and lastly. By planting trees for ornamentation and shade we shall have more fruit and better fruit, better crops of grain and grass, and better horses and cattle, and more pleasure and purer enjoyments in life. We need trees around our orchards to give out warming and tempering influences in the springtime when the trees are covered with tender blossoms and the air is loaded with pinching cold. We need the presence of trees around our fields and our homes in summer to condense the cooling vapors and to invite the pleasant zephyrs to fan our parched brows. More especially we need the presence of trees in our winters, to offer a calm resistance to the raging blast, and to shelter the tender buds of our fruit trees from the withering cold and killing frost. We need their grateful presence around the home of our loved ones, for their presence is cheering to our eyesight, and it is a relief to look upon them while nothing but whiteness is all around. Only for one moment let us imagine the total eradication of all our blessed trees from the surface of our fair country, and what would become of us? Let us each in our humble way strive to add our humble mite to the sum total of our engagements of this humble life below by planting a few trees to live and testify of us after our heads are laid low and our hands are still in everlasting rest.

UPON THE PUBLIC ENCOURAGEMENT OF FOREST TREE-PLANTING.

BY FRANKLIN B. HOUGH, PH.D., CHIEF OF FORESTRY DIVISION, DEPARTMENT OF AGRICULTURE.

(Continued from page 328.)

I WILL briefly describe this timber-growth among the mountains, and the methods of removal that must be employed. The trees are chiefly Pines, Firs, Cedars and Spruces, and grow in Cañons and Coves, sometimes spreading out into high upland plains, and upon the "divides;" but still leaving many ridges and crests devoid of trees of any kind. Of course, above the timber-line, it is utterly hopeless and arid. Along the higher levels, the Quaking Asp forms considerable tracts, and this tree tends, in many places to spring up where the other kinds have been cut away or destroyed by fire.

Lumbering operations can be carried on for only a few weeks in the latter part of summer. Rafting is wholly impossible, and even floating can be practiced only occasionally for railway ties and cord-wood, excepting by flumes, in special cases. There can be no winter work, as in our eastern pineries, no accumulation of logs beforehand, and no piling ot lumber for seasoning, unless at great risk, and for removal the next year. The timber must be brought to the mills as soon as cut, and the stuff must be got out before the early autumnal snows render it impossible.

Now it would appear at first thought that no timber-privilege could be granted before a survey. In these mountain regions the surveys are carried on as upon the prairies, in lines running north and south, and at right angles to this direction, without regard to the surface. They are costly operations, and it will be a long time before they will be extended over these mountain woodlands—in fact it could not be done before the timber is all gone.

But let us see what use could be made of them, had these lines been run. Supposing that a timbered section was divided in the middle by a ridge, would the timber ever be drawn over it from one valley, in order that it might be drawn down the other? I need not insist, that the bottoms of the valleys are the natural and only routes by which the timber could be removed.

My plan would be briefly this. I would have a central Forest Administration, with trust-worthy agencies for local supervision. Through these, the extent and probable value of the timber growing in the valleys could be approximately ascertained by exploration.

I would then lease the privilege of cutting timber to such as could guarantee compliance with the terms, which should be as follows:

1. The title of the land itself should remain forever in the hands of government, and devoted to timber supply.

2. The lease of privileges for cutting timber should be for short periods, with right of renewal upon compliance with the terms.

8. There should be paid an annual ground-rent, and in case of competition it should go to the party who would pay the most for it, in addition to the ground-rent.

4. The principal revenue, however, should come from a tax upon the products taken out,—as so much per cord, or per thousand feet (board-measure, cubic or linear, as the case might be), and as it must pass out at one place, the collection of this tax or toll would be easy.

5. There should be a strict prohibition against the cutting

of trees below a certain size—and obligations of great caution in the use of fires.

6. The boundaries of timber-limits should be the dividing crests of hills and mountains, the bottom of valleys, and other natural or artificial lines best adapted to the delivery of the products.

7. The tolls upon products should be subject to such modifications, from time to time, as the public interests and justice to the contracting parties might require.

We have in this brief outline the system of timber-leasing, which, with some modification, has been in successful use in Canada for a long time, and from which the government has derived considerable revenues. Under judicious management, in our own country, it would much more than defray all the expenses of Forest-management, including those I am about to mention, and might do much more, if it was thought good policy for the government to derive a revenue from this source.

It would, above all, give to the holders of the privilege the protection of the law, as against the lawless—and put an end to the grab-and-take custom that now prevails, and under which, sometimes, large bodies of timber have been felled upon speculation, to establish a claim upon it, when it should be wanted at a high price—but the demand not coming, it has been left to rot upon the ground. This happened some years since with a valuable tract of timber at the divide between the Big and Little Cottonwood Cañons, in Utah—both of them rich in silver mines, and alike easily supplied so far as communications were concerned. They both needed this timber for mining structures exceedingly, but something happened that hindered it from being used, and it rotted on the ground. Similar results have happened many times with timber tracts, which need from five to six hundred years to grow to these dimensions, and which the most careful cultivation could not sooner restore.

There are already diffiulties in the way of putting the system of management I have mentioned into effect, and they are every year becoming worse. It often happens that a land-claim is established in the bottom of a valley, under which the owner asserts the exclusive right to the timber on the public lands behind and above him, for which he holds and asks no title, and on which he pays no taxes. It is very certain that no one else could get access to it without crossing his land—which he might prevent them from doing until a a highway was laid out, as by law provided. In like manner, the only available points for landing and shipment along a bay or river have already passed under the control of persons who could prevent others from enjoying them, at least for a time, and until these rights could be made public. The difficult of adjusting these rights, and of preventing these wrongs, is every day becoming greater; it will certainly never be less than it is to-day.

With respect to certain bodies of timber still owned by the government, as for example in the Redwood forests upon the Pacific coast, we believe it to be both feasible and proper to apply, without delay, a system of direct management quite similar to those in Europe, in which the timbers already full-grown might be turned to use, and measures might be adopted in the interest of the future, for renewing the growth upon lands once cleared. But as I have discussed this subject somewhat in detail in my third Report to Congress, I will make no further reference to it here.

There is one subject claiming the care of the General Government, which deserves immediate attention, namely: the formation of Experimental Stations for ascertaining the range of possible and of profitable cultivation, in regions where no experience has accrued, and where the success of planting is at first wholly unknown. The average settler upon the Prairies and the Plains is a poor man; at least he seldom has a surplus of time or means for experimenting, and can only trust, with safety, to methods well known. If he has had experience in tree-planting, it may fail altogether, when applied to new and widely different conditions, and this perhaps repeated a few times, may impress the belief that success is impossible, and thus he may discourage others, who relied upon his experience, and are disheartened by his failures.

There are certain facts well known before-hand, such as that the Chestnut will not grow in a limestone soil, and that the Eucalyptus will not endure the frost; but there is an infinite amount of scientific information to be acquired, that never can be known, excepting through well organized systems of experimental observation and costly research. These are for the most part beyond the means of the private citizen to undertake. Of such are our Geodetic, our Hydrographical and Geological surveys,—our systems of Astronomical and Meteorological observation—researches into new, and as yet but little known processes in the arts, and the widely varied range of investigation, in which all enlightened governments are engaged, for the purpose of extending the boundaries of knowledge and for the benefit of mankind. Their success would depend wholly upon the intelligence of those to whom their care was entrusted, and they should be managed in the spirit of an *investigator* and not of an *advocate.* An enthusiast will sometimes allow himself to be carried away with a one-idea fancy for some one thing, as Cobbett did with Locust-trees, which he would plant everywhere, always.

There have been partisans of the Larch, the Oak, and other trees, quite as little discriminating, and I cannot too strongly impress the idea, that we need to follow *principles* rather than *precepts.* If we thoroughly understand the requirements of different trees, and can discriminate as to the conditions in which they must be placed, the question of success is settled, or its limits are soon found.

An Experimental Station would be less needed in a region once timbered, for we know that what has grown could be made to grow again. But upon the Prairies we cannot know that one tree will thrive better than another, or that any kind will prosper until we have tried them. In this we have much to learn from failures, as well as from success, and in a widely varied series of experiment, there would now and then be found one, which would be set aside to be avoided thereafter. Others at first doubtful might require particular management, and others might promise a wide range of success.

As to the extent of the first experiments, they should be widely varied, and should extend to every incident connected with the planting and growth of trees. The scientific questions involved should be made a matter of careful study, and the conclusions when ascertained, should be made widely known.

A first-class station would require much hard labor, and in this, opportunity should be given to those wishing to learn.

It might eventually grow into a school of practical Forestry, and better for our condition than those upon the European plan.

As to the location of such stations, we should remember that our country has a vast range, and that there are widely different features of soil and climate to be studied. They should be placed at proper intervals across the western plains, within the limits of probable success, from our northern boundary to the Mexican line. There are conditions that need study in semi-tropical Florida, in the Pine regions of the Southern States, upon the plateau of Colorado, and upon the Pacific Coast.

At every Agricultural College already endowed by the General Government, experiments in planting, and in the acclimatization of species, should be undertaken, and aid should be furnished to other institutions that have grounds upon which they could be made. They should have collections of living trees in as wide a variety as the soil and climate would favor, and every species should be duly labeled. At places convenient for meteorological observation, in the open fields and in the woodlands, for comparative records in studying climatic conditions, the means for conducting these observations should be provided, and finally, the knowledge gained by these experiments and records, should be carefully worked out, and given to the public for its instruction and guidance.

I now come to the most important question, as to how a State may best encourage Forest-planting. We have already noticed that in all the older States, and in some of the new ones, the States possess no public lands. For the present we will regard this as true of all of them.

By a recent law in Massachusetts, the towns are empowered to purchase waste lands, and place them under forest management, and efforts are now in progress to raise by subscription the means to purchase such lands for this purpose. This may succeed in certain cases, but I can not look upon it as likely to become generally adopted. In wealthy communities, some picturesque parks may be created, but the average American farmer is not inclined to spend time or money upon land not his own; much less will a city or town expend in planting private lands.

In some of the States, tree-planting has been encouraged by the payment of premiums; in some instances, as in Iowa, large premiums, based upon the area planted, and in a thriving condition at a certain time afterwards. In some cases this led to fraudulent claims, and in Kansas a law of this kind was, after some experience, repealed.

I believe a much better way would be to exempt lands planted with timber-trees from taxation for a limited period, as is done in Maine. It was tried in Nebraska, until stopped by an amended constitution, which forbade the the exemption of private property of any kind from taxation, but was followed by another act, providing that the *increased value* of lands thus planted should not be taxed for a certain number of years.

I regard this law in Maine, or in Nebraska, as going about as far as a State can afford to, without giving just ground of jealousy on the part of owners of property in other forms.

But when direct premiums are offered for the best success, the largest amount planted in a given year, the cheapest and best methods, and other points worthy of imitation and tending to emulation, the case is different. There the distinction won by a prize or a diploma of honor may often lead to a great public benefit, from its presenting an example worthy of imitation. Such premiums can best be awarded through societies organized for encouragement of Forestry, Agriculture, Horticulture, and rural improvements generally. They should always be conditioned to the rendering of a report upon the time and manner of sowing or planting, the mode of management, and other information that would be of public interest. This should be carefully digested and widely published, through the agency of societies, or directly by the State.

The State of Michigan has an excellent law, which requires a certain amount of planting along the highways, by the owners of the adjacent land, or at their expense. The planting is to be done under the control or to the satisfaction of the Commissioners of Highways. This law is obligatory, and the planting must continue at a certain rate a year, until the roads are all lined with shade-trees, unless the inhabitants excuse themselves therefrom by a vote in town meeting. This law applied in the prairie States,would prove of immense advantage as so much towards the establishment of wind-breaks, besides proving a useful guide to the highway in winter, and as affording a grateful summer shade.

This planting under town authority and at the public cost, is highly proper, for the protection of roads liable to drifting snows, and upon shores exposed to drifting sands. There are cases when it would be proper to plant and maintain a belt of trees, as a measure of public utility where they would shelter a village from inclement winds, or intercept the malaria from marshes.

A State might with great propriety, and with the best results, establish Experimental Stations, in connection with nurseries for the supply of seedling trees. This was one of the first things done in Norway, since it has in recent years begun to feel the need of forest-planting. The plants are sold *at cost*, and with them are issued little tracts with plain and simple directions for their planting and care, that a peasant can undertsand. The assortment offered, includes the kinds most useful for timber, and surest to grow—some of them being foreign species that are known to be well adapted to the soil and climate of the country. These nurseries are usually connected with elementary forest schools, of which there are several in that country and in Sweden, where the pupils are mostly engaged in actual labor in the summer, while they receive instruction in the class-room in winter. The pupils before entering, must have a fair common-school education and a single year under skilled instructors, imparts a large amount of practical education for the duties of superintendent of working parties in woodlands and nurseries.

It is well worthy of inquiry, as to whether the State might not profitably require, or encourage the teaching of a few of the elements of tree-knowledge in its schools and academies. The children might be interested in planting operations where the chance offered, and be told the reasons why such or such a practice is right or wrong. But here I encounter a difficulty in the fact that the teachers themselves need instruction. It follows that something should be done in our Normal Schools, towards interesting those who are to become teachers, and enabling them to discharge their duties. In short, no class should graduate from any Normal School or any College, without having an opportunity of hearing at least a few practical lectures upon the. subject of Forestry. They should have collections of woods, and of botanical specimens or drawings, at least enough to give some ideas about trees, their planting and their uses. Labeled series of such specimens, of wood, showing the woods in their native state, the finish they will admit of, and the distinctive characters of the wood and bark of each, would not cost much, and might be furnished to each institution. It would be better still, if systems of collection and exchange could be undertaken in vacant hours by teachers and pupils, in different regions.

You have in this State an *Arbor Day.* The object is most praiseworthy, and the result excellent. If it has any fault, it is that a rainy day may interrupt the work,—and unfortunately it comes but once a year. In offering premiums for the greatest number of trees planted, I think a better result would come from offering prizes to those who planted most and best in a year. They could then select their time and opportunity, and might accomplish a great deal more.

But I must bring these remarks to a close, and in doing so can only urge the necessity of bringing to the public notice, upon all proper occasions and in the strongest possible manner, the need of planting and of maintaining a suitable proportion of woodland growth.

I urge as the first and leading motive in this, the benefits that groves and timber belts secure to our orchards and cultivated fields,—increasing their production and preventing the injuries that might otherwise result. Next, I would point to the amenities that they bring to our homes, and the protection they afford against bleak winds and driving storms, obstructing travel, and often causing great hardship and loss of life. Lastly, but not least, the supply of wood as a material is absolutely necessary to our daily wants, and the diminishing supplies admonish us that it is wise to prepare to meet these wants before we feel them severely.

To those who might say—"I can never live to see full-grown the tree that I plant,—why should I care for the future?" I would remark:—that this beautiful world of ours is held only in trust. We should not leave it the worse from our having lived in it.

Now a grove planted on a prairie farm adds to its value from the first moment, at least as much as it has cost. This value gains every year in amount at a faster rate than any other investment that can be put upon it, and this value can be realized at any stage of growth, by the sale of the land on which the timber grows.

It is a noble ambition in man, to seek to lay up an inheritance for his family. He toils through life to acquire a comfortable home and an estate, which he knows that others will enjoy. Now if by planting a part of his farm with groves of woodland, so that the whole will be worth several times as much as it would be without them, does not the owner attain the object of this honorable ambition?

Although woodlands thrive in some places where nothing else can be made to grow,—and all such places should be covered as soon as possible,—it is equally true that deep rich soil grows timber a great deal faster and better than soils that are dry and shallow. Do not grudge to give a part of the best land you have to this use, and the remainder will be all the better for it.

Count well the cost and the profits, and your figures will bring out an ample balance on the credit side of the forest-account.

I have said nothing of the amenities of life that may be gained from ornamental planting around dwellings, or in parks and waste places near cities and large towns. They tend to create a love of home and country,—to form an attachment to an ancestral seat and encourage substantial investments for permanence and future enjoyment.

The man who comes only to get rich, and to depart when he gains his object,—never spends money upon schools or churches, or libraries, or institutions of any kind, that are to last longer than he remains. The solid and substantial foundations of society, are laid and monuments are built, only by those who are strongly attached to the place where they live, and where their families are to live after them. There is nothing that so strongly binds a man to a place as the bright memories of life, due to cheerful homes and pleasant surroundings. These can not exist in a bleak and cheerless waste; they can only be secured by timely and judicious planting.

THE TRUE AND FALSE IN ARBORICULTURE.

By WILLIAM ROBB, of Montreal.

[A paper read at the Montreal Session of the American Forestry Congress.]

IT is the misfortune of our country that the primitive elements of its wealth and of its beauty should have been the chief obstruction to its agricultural progress. The original struggle with the primeval forest has left a legacy of antipathy to all that recalls it. That which should have been the friend and companion of man came to be regarded as his enemy, and the last vestiges of sylviculture were ruthlessly swept from his path.

That the feeling is dying out and giving place to a higher regard for trees is true, but it has left an impression that it is more difficult to prevent than to promote their growth. That impression has led to their reckless treatment, and chief among its errors is the one followed in the pruning or removal of branches. Where this has become necessary it has been an almost universal habit to cut them several inches (or even feet) away from the parent stem, the impression apparently being that this method is less severe on the tree than cutting close to the trunk. I venture to say that of one thousand trees pruned in the Province, nine hundred will be found to have been treated in this way, and yet it is safe to say that every one of these, so far from being benefited, has been injured, if not destroyed, by the operation. It is fatal to the tree, and, instead of relieving it of an incubus to its growth, introduces an element of decay.

Just as sure as a portion of a branch is left projecting from its parent stem (without a literal twig, to which it is so pruned as to insure, through it, a circulation of sap) just so sure will decay be transmitted by that portion to the parent stem whose death is thenceforth regulated by the number and extent of such amputations.

A branch lopped off otherwise than close to the stem from which it springs, must shrivel up, rot and carry decay back into the heart of the trunk. There it will not cease to corrode till it has eaten the life blood of its victim. Let any one examine two trees which have been so treated and he will find ample proof of the assertion.

The reason being, as every gentleman here knows, that the ascending and descending sap, which alone can form new wood and heal over the cuts, is interrupted in its flow by the protuding stump. It can not flow out to and around the end of it, but bulges out in unsightly cushions at its base in its efforts to do so.

If it be asked how it is that some of these cushions actually do force themselves over and inclose the stump—the answer is that these are cases where the comparative closeness of the cut and exceptional vigor of the tree have admitted of it; but it is in spite of, and not because of the fact and it by no means follows that they have not inclosed seeds of decay which will thenceforth work insiduously underneath.

But on the other hand, it is equally true and demonstrable that a branch cut off close to the trunk or parent stem, soon heals over, leaving a scarcely perceptible scar, and adds to the vigor and health of the tree.

Nay, more, if the shriveling stump and bulging cushion be so cut off before their decay has reached the trunk, the same result will be obtained, and the life of the tree secured.

Should a conviction of this become as universal as the prevalence of the evil it would remedy, we should see such a stirring among the dry bones of old limbs as would produce a veritable resurrection unto life, and save thousands of trees from early graves. The misdirected energies of humanity form a sad subject of contemplation. It is as easy to do a thing right as to do it wrong, if we are only taught which is the right and which the wrong; but one may, with best intentions, spend toilsome days trimming trees, which he hopes will gladden other eyes than his, only to learn, perhaps, that he has hindered rather than helped them.

In a matter so simple, but so important, correct information should be universal. It should form part of the curriculum of our schools. Men and women every-where should understand the habits and culture of those creatures of the great All Father who formed them, like the flowers,

> "To comfort man,
> To whisper hope, whene'er his faith grew dim,
> For, who so grandly clothes the trees,
> Will much more care for him."

But it is not alone the descendants of the original settlers who sin against this principle. Others, with less excuse, follow their example or fall into the same error, and chief among the transgressors are the telegraphic companies of the land, who hack and mutilate the trees along their lines with profound disregard of their habits or requirements.

You may possess a row of trees which you regard with pride and affection, which have taken many years to arrive at perfection, and which charm every eye that sees them, but the inevitable telegraph arrives and some fine morning you wake up to find them mutilated beyond recognition and the road strewed with their debris.

In the excitement of the moment you rush for your gun, a club, scythe, any thing calculated to inflict punishment commensurate with the enormity of the offense, but they have gone, fled like a plague of locusts, to continue their work of destruction on some neighboring victim.

But, though they have escaped summary vengeance, you feel that the measure of their iniquity is full, and you resolve to follow them with the bloodhounds of law. But, standing at the threshold of telegraphic legislation, you find privileges granted under which they might commit almost any depredation.

No doubt it is necessary that power should be given to carry out their charters, but all privileges granted to an individual or class are limited by the rights of all other individuals. Yet here is a power given which inflicts enormous injury on every one subjected to its operation.

Neither the legislature when it granted, nor the companies when they asked for such privileges, could have anticipated for one moment the injury they would inflict on others, but now that the result is apparent it ought to be remedied.

Single trees, which money would not tempt the owners to part with, have been ruined by them, what then must be the aggregate of damage inflicted upon the whole country. The very least they could do would be to employ only such men as were familiar with arboriculture, and permit no cutting to be done which was inconsistent with its principles.

The "False," then, to which my paper has reference, and to which all these are parties, are found in the idea:

That projecting stumps should be left in all cases where it has become necessary or desirable to remove branches—as being less severe on the tree than if they were cut close to the trunk or stem from which they spring—and that pruning is safe only when that plan is followed.

And my contention is that precisely the opposite is "The True," viz:

That no stumps should be left when removing branches; that it is more severe on the tree to do so than to cut close to the trunk, and that pruning is never safe when that method is followed, but that all amputations should be made on the line of connection with the parent stem; wounds thus made healing over more rapidly and easily than if made at any other point, and that pruning is safe only when this principle is adopted.

While deprecating all pretense to authority as an expert, generally, I desire to give no uncertain sound on this issue; it has an important bearing on the success of Forestry, in all its departments, and affects every one who has a tree to care for. I court the most searching criticism for my own sake and for theirs. If correct, it ought to be widely taught, for the need is widely spread; if incorrect, no better opportunity than the present could arise to show it.

In France, Belgium, and on the Continent generally, it is universally taught. Twenty years ago the directorate of the Natural History Gardens of Paris strongly insisted on its importance, alluding to it as having then had a forty years' record of perfect success. And yet, to-day, in Canada, if one may judge by observation, nineteen-twentieths of our people are wholly ignorant of it. It is the function of such societies as this to disseminate correct information on these subjects, and if the opportunity which has now been given to discuss it should have this effect, Canada will have reason to be grateful to the "American Forestry Congress" for holding their conference in Montreal to-day.

True, an occasional exception exists. Here and there you find that some one had risen above the circumstances, and with taste, forethought and care, formed an oasis in the surrounding waste. All honor to such, for they have rescued the land from general bleakness and shown how beautiful it might be made.

Were tree-planting universal along the highways, lanes and prominent passage-ways of our country the effect upon the mental and moral training of the people would be very marked. The result to cattle, beasts of burden and the soil itself would be most beneficial, and the whole land would assume the appearance of a cultured park or garden.

TREE-PLANTING FOR RAILROADS.

By Dr. JOHN A. WARDER.

[Read at the Montreal Meeting of the American Forestry Congress.]

NOT long ago some suggestions were advanced by the New York *Post* or *The Nation* newspaper, intended to show how large operations in Forestry might be carried forward by the combination of capital united in joint stock companies. The contributions of many persons, even of limited means, could thus be brought to bear upon the subject effectively, and the company could be enabled to carry forward operations of a magnitude that would be altogether beyond the ability of most individuals to conduct separately, and thus a number of persons could unite in a work, the undertaking of which would be impossible for most of them separately. To grow a forest of any extent (deserving the name) requires a large capital; the land must be purchased and put in order, whether we pursue the plan of conservation of the natural growths or by sowing or planting anew. Not only for land, material and labor will money be required, and a good deal of it, but the returns will necessarily be slow. The long rotation of most trees puts the profits of the harvest beyond a generation of men, hence, they who plant can rarely expect to reap. This tree-planting, however, is to be a permanent and a sure investment of capital, and being for a while without annual returns, it has little attraction for the poor man, who needs to keep his means in circulation. Like insurance, it is a continuous drain until the trees are established, but when they reach maturity the returns are eminently satisfactory. How many persons constantly bury their capital in the hidden recesses of the earth by taking stock in companies to explore and develop the mines, and wait for many years before the glittering gold appears in the shape of the coveted dividends. But men are led on by hope of the eventual returns.

The forest is a long investment, but a certain and safe depository for our means, where bountiful nature is ever adding to the capital. The trees are growing while we are sleeping, and a well-managed forest is ever increasing in value; in it the rich lode may be worked continuously, the veins are never exhausted or cut off, like those of the mine, by horseback nor fault. Hence the desirability of such an investment, and in the corporation the combined small contributions of the many, in sums that they can spare by using economy, are enabled when thus aggregated to carry on works that would usually be possible only for the rich landed proprietors. Even small amounts of subscriptions to such stocks, aggregating a sufficiently large amount, will enable the company to procure land and proceed with the plantations.

The railways are already incorporated; thanks to the lavish aid of our Government they are in possession of millions of acres; they hold large principalities of lands just where forests are most needed to meet their own enormous demands for future construction and repairs, as well as to supply the necessities of the rapidly increasing population which they invite into the country—and just where, for the sake of their influence upon climate, the forests are most required—for it is firmly believed that the disastrous storms, hurricanes and cyclones that seem to be bred upon those arid regions, or on the mountains beyond them, will at least be greatly modified, if not entirely prevented on the plains, wherever a sufficient amount of the territory in question shall have been covered with trees.

These railroad corporations are wealthy and abundantly able to carry on such works. Years ago some attempts were made by these Pacific roads, which, however, were rather experimental and intended to prove the possibilities of tree-growing on the plains; but from lack of practical knowledge on the subject by those in charge, and for want of perseverance by the managers of the roads, these spasmodic efforts were abandoned during the financial panics. The Northern Pacific, under the persevering efforts of Mr. Leonard B. Hodges, and the Union Pacific, with the enthusiasm of J. T. Allan, sustained by Land Commissioner Burnham, have again undertaken the good work, and within the past two years have been planting groves, about the station-houses along their lines, even where irrigation was necessary to sustain the trees. Experiments have also been made with more extensive plantations of trees, which are intended for utility rather than mere ornamentation and comfort.

Some really important work worthy of note has been begun and has reached a degree of success. It was inspired by that noble and intelligent forest advocate and student, Prof. C. S. Sargent, Director of the Arnold Arboretum, near Boston. This refers to planting extensively by contract, undertaken by Messrs. Robert Douglas & Son, of Waukegan, Illinois, with the Missouri River, Fort Scott and Gulf Railroad, and also with a private gentleman of wealth, who is largely interested in the same road, but who has undertaken his planting as a profitable investment. These contracts are of such magnitude as to be of great importance, since they consist of one entire section for the railroad and nearly as much on private account. The data here given have been received from private correspondence with the gentlemen engaged in the work, and in part from a Boston newspaper, the *Herald*, which was in direct communication with the other contracting parties, and therefore they are quite reliable.

The forest plantation referred to is owned by the M. R. & Ft. Scott & Gulf Railway, and is located at Farlington, Kansas, in 37° 30′ N. Lat. The 560 acres planted on private account is four miles further south; both are on high and dry prairie. The trees are planted 4x4 feet apart, except the White Ash, which are set 4x2 feet. This locality is rather too far west and south for most of our eastern trees, but seems especially adapted to the Catalpa and Ailanthus.

Of the Catalpas, all *speciosa*, 100,000 planted in the autumn of 1878, and the following spring, with three summers' growth, had reached eight and ten feet, with a diameter of trunk two to two and one-half inches. The 217,600 Catalpas planted the next season, with two summers' growth, had attained the height of four, five, and even six feet. Despite the severe drouth of 1881, those planted in 1881, 155,000 Catalpas, in one summer, made a growth of eighteen to thirty inches, with the terrible drouth that ruined the grain crop.

In the fall of last year 288,000 were planted; from these the tops were cut off above the collar as they were put into the ground.

The Ailanthus after growing two years had reached six and eight feet, with diameter of two inches.

On the other tract the following amounts and acres were set out: Catalpas, 75 acres; Ailanthus, 40 acres.

White Ash, 60 acres, set two by four feet, which required 326,400 plants, making a total of 530,400 trees planted. This plantation was continued during the current season.

The Catalpa plantation of 4 x 4 feet has been easily cultivated and has required no pruning. The trees that have three years' growth required little care the third summer, and pruning can be entirely dispensed with. The tops shade the ground and prevent the growth of weeds; they are very uniform in size, so that they will stand 2,500 to the acre of contract size, four to six feet.

In his letter Mr. Douglas adds this item, which will be of interest to the private planter: "From our past experience with this tree we think, in the case of farmers planting (the cost of trees being an object) they might be planted 6 x 8 feet, with a hill of corn between the trees and a row of corn between the rows. This would require 680 trees, and would allow 2,040 hills of corn per acre. The tall growing corn would have the effect of close planting upon the trees. The corn might be grown three years, after which the trees would meet and shade the ground."

The contract is thus described in the Boston *Herald:* A Boston capitalist has contracted for the planting of 560 acres of prairie land in Eastern Kansas. This contract is made with the Messrs. Robert Douglas & Son, of Waukegan, Ill., the largest and most successful raisers of forest-tree seedlings in the United States, and is peculiar and novel in its provisions. They agree, at a certain price per acre, which would differ, of course, with different conditions and location, to break and plow the land, prepare it for planting, plant not less than 2,720 trees to the acre, and cultivate these until they shade the ground and so require no further cultivation, to keep down the weeds and strong natural grasses. At the end of this time, probably in three or four years, the trees will be delivered over to the owner, one cent being deducted from the final payment for every tree less than 2,000 to the acre delivlivered, which must be at least six feet high at the time of delivery. The advantage of this plan, which is the one also adopted by the Fort Scott Railroad, is that the trees will be carefully planted and attended to by experienced men, for whose interest it will be to use the best plants, and to cultivate and care for them in the best manner, so as to be able to deliver the greatest number of trees in the shortest possible time, that they may get quick returns for the money invested in plants, planting, etc. Any plantation in which the trees are six feet high, and in which the ground is so shaded that weeds and natural grasses can not grow, will require no further attention until the time comes for thinning them out for fence-posts, etc. The plan relieves the owner of the great risk always attending the early years of a plantation, and makes his investment practically safe. This plantation of 560 acres is to consist of 300 acres of the Western Catalpa, 200 acres of Ailanthus, and 60 acres which will serve as an experimental ground on which will be tested trees of several varieties, to be selected by Prof. Sargent, the director of the Harvard Arboretum. The Western Catalpa, a native of the low lands bordering the lower Ohio and the banks of the Mississippi in Missouri, Kentucky and Tennessee, is a rapidly-growing tree, easily cultivated, and growing timber which, although soft, is almost indestructible when placed in the ground, and, therefore, of the greatest value for fence-posts, railway-ties and similar uses. The Ailanthus will grow with great rapidity wherever the climate is not too cold for it, and in spite of its wonderfully quick growth, produces hard, heavy timber, valuable for fuel, ties, cabinet work, or almost every purpose for which wood is used.

It is believed that this plantation will soon lead to the formation of others, both by the railroad companies and by individuals, or corporations chartered to plant and own timber lands in the prairie States. Eventually a great deal of capital will be invested in this way. The returns will be slow, and a man investing thus should consider that he is doing it for his children. But when the returns do come they will be enormous, even at the present prices of lumber, and it must be remembered that before a crop of trees planted now can be harvested, the price of ties and other forest products will be more than doubled in the Western States. An encouraging fact, and one which shows that public attention is being directed to the importance of providing for the future demand of such things is, that the Iron Mountain Railroad Company, which runs for hundreds of miles through a heavily timbered region, and possesses in its own lands some of the finest White Oak on the continent, has also made a contract with the Messrs. Douglas, to plant near Charleston, Mo., 100 acres of Western Catalpa as an experiment. They do this because Catalpa ties have stood on their road, scarcely affected by decay, more than twelve years, and because this tree is so valued by the farmers for fence-posts that it is already practically exterminated in Illinois, Indiana and Missouri, and so not to be procured for ties, although the superintendent of the railroad is willing to pay three times as much as for the best White Oak ties. If the planting of trees is good policy for a railroad running through a heavily timbered country like Missouri and Arkansas, it will certainly pay for roads in Iowa, Nebraska, Minnesota and Kansas to do the same.

FORESTRY IN THE GREAT PRAIRIE REGION.

By CHARLES A. WHITE, M. D., of Washington, D. C., Palaeontologist on the U. S. Geological Surveys.

THE question of the origin of the prairies is one which has become so trite that popular interest in it is now seldom mainifested; and yet the question, as it is usually propounded, has so direct a bearing upon the subject of Forestry that it must always retain its interest in this connection. Whatever may be the cause of the absence of trees upon any part of the earth's surface, there is no greater fallacy than the assumption that trees will necessarily fail to grow upon *every* area where they have not hitherto naturally grown.

There are two general physical conditions which are inimical to forest growth, and wherever either of them is fully established, forests can not exist. One of these conditions is an arctic climate, whether produced by high latitude or high elevation above the sea; and the other is an arid climate, or one where the annual rainfall is insufficient for the purposes of agriculture. I hold that in all regions of the earth which are not affected by either of these great climatic conditions, the foresting and reforesting of the surface is practical under intellegent guidance.

As regards the great prairie region of the United States, I think it is safe to say, that the foresting of its surface is practicable over all that area within which Indian corn can be successfully raised as a farm crop.

Forestry will, no doubt, be precarious in those prairie farming regions which lie too far north for the successful raising of Indian corn; at least as regards many of the kinds of trees that grow successfully further south. It will also be precarious for all kinds of trees in the region which borders upon the great arid area of the West, where farm-crops are subject to frequent failures from drouth. My own observations, extending through a period of forty years, convinces me that upon all of that great prairie region which embraces Illinois, Missouri, Iowa, the eastern portions of Kansas and Nebraska, and the southern portions of Minnesota and Wisconsin, forest trees may be grown with as much certainty and success as crops of corn.

The facility with which forest trees will grow in that region has been demonstrated in thousands of instances; and since the suppression of the annual fires which used to sweep those prairies, portions of them are fast becoming forested by both artificial and natural means.

The successful growth of trees in that region is not confined to any one kind, nor even to a few kinds of trees; nor to any one or more varieties of soil. But within that whole region, every kind of tree that naturally grows upon its most favored spots, will also, if opportunity be given, grow thriftily upon any of its prairie surfaces, and in any variety of its soil; for the character of the soil differs considerably in different parts of the region.

The experiments referred to, have shown that the owner of any productive farm in the great prairie region, who wishes to plant trees upon it, need not be deterred from doing so by any other consideration of the character of his soil than he would give to a farm crop.

As one goes westward upon the great prairie region, he finds it to merge into the great arid plains of the West so gradually that no definite boundary between them exists. These plains, in the aspect of their surface, their treelessness, and the composition of their soil, are so much like the prairies into which they merge, that many have come to believe that the treelessness of both is due to one and the same cause, or rather that both are equally incapable of supporting a forest growth.

The truth is that trees can not grow upon the plains because of their aridity, but they can and do grow upon the prairies because they have sufficient moisture from the annual rainfall. In accordance with custom, I have used the terms "prairies" and "plains," which are well enough understood. But in reality the areas which are included under these two names respectively, constitute one and the same great prairie region, which extends continuously from Illinois to Colorado. The western portion of this broad region is too arid for forest growth, but the eastern portion is not.

But, it may be asked, if the subject of the practical foresting of that great region is reduced to a question of sufficient or insufficient moisture, why have not forest trees long ago naturally occupied the prairies, where moisture is sufficient for their growth, and up to the line upon the great plains where the annual rainfall is insufficiant?

The question is a pertinent one; and while it may not be answered categorically, many suggestions may be made which point to its solution.

Why, we may ask, should it be assumed that a forested, and not a treeless condition of the surface, is the natural and normal one?

Nothing would seem to be more natural than that any continental area, upon its emergence from the sea, as the great prairie and plain regions have done, should be first occupied by an herbaceous, and afterward by an arboreal flora. At any rate, a flora, whether herbaceous or arboreal, must be supposed to have reached all the nearer portions of the continent by a natural process of migration or distribution from the older areas which it had occupied.

To effect distribution, favoring conditions for distribution as well as for occupancy must exist, and the existence of the latter does not presuppose the existence of the former. Why then should not a new area remain unoccupied by certain plants to which it is well adapted, even for thousands of years? Why then should we wonder that the prairies have remained treeless so long? In the floral occupancy of any region, certain local conditions would of course accelerate the distribution of certain kinds; and the same or other local conditions would retard the distribution of others. Prairie fires have not retarded the distribution of grasses and other herbaceous plants; but they certainly have retarded, for hundreds of years at least, the distribution of forest trees.

Because trees are absent from the prairies when it is known they are capable of growing there, some suppose that trees once did grow there, and that by some means they have been destroyed. Therefore they talk about the "origin of the prairies." It is certainly more philosophical to inquire into the origin of forests, for fundamentally, the question of a forested or treeless condition of a region is a question of primary distribution of plants. It is, I believe, in connection with the great subject of the distribution of plants and their regional limitation that we are to find the true explanation of the treelessless of the prairie region.

As the natural distribution of a flora is one depending on propagation, and as various obstacles are to be overcome, it must necessarily take much time for its accomplishment. Therefore the limits of the potential distribution of a flora seldom or never fully agree with the actual distribution of the same; and, in many cases the potential boundary of a floral area is far beyond the boundary of actual occupancy. Such is the fact in relation to the growth of trees upon the prairies; and indeed all nature is full of examples of this kind. If the potential and actual boundaries of floral regions were identical, there would long ago have been an end to distribution, and forests would now occupy only a small, if any part of the continent.

The western potential boundary of forest distribution, upon the great prairie region, runs somewhere through Kansas and Nebraska; but, with the exception of some narrow strips along the borders of the rivers, their actual boundary of occupancy, when white men first knew the country, was more than five hundred miles to the eastward.

In the foregoing remarks, as applied to the practicability of foresting the prairies, I have of course had reference to those kinds of our native trees which grow naturally and thriftily in the forest regions of similar latitudes to the eastward, or that occupy the river bottoms and valley sides in the same region with the prairies. A similar limitation, as to species, will necessarily prevail in the artificial foresting of the prairies, that would have prevailed if they had been naturally forested. For example, the number of kinds of native trees which it will be practicable to grow in the northern portion of the prairie region will be somewhat less than in the southern; but it will be great enough to meet the ordinary wants of the inhabitants. Besides this, it is a fact too well understood to need special mention, that many trees brought from other countries will grow quite as thriftily as the native ones.

SMITHSONIAN INSTITUTION, *March* 7, 1883.

[We would attach less importance to the limit assigned by our correspondent, with respect to the planting of certain trees upon the prairies, within the region where Indian corn can be raised with success. While it is indeed true that many of our more valued trees grow best in the climate best suited for that crop, and can not be raised where it will not grow, there are other and scarcely less valuable timber trees that thrive with great luxuriance far beyond these limits. We might probably say that, without exception, trees of *some* kind, will succeed wherever grains of *any* kind can be grown, so far as climate is concerned. There are many places in which, from the rocky or broken surface of the ground, trees become the only crop that is possible, and where without them we have an utterly barren waste.

Although frosty summer nights may prove disastrous to seedling trees, as noticed on page 268 of this JOURNAL, with some of our hardy northern species in Finland, we still find native Birches, Poplars and Willows, and several of the more hardy conifers, growing in regions where it freezes every month in the year, and where it is scarcely possible to raise crops of any kind.

We quite agree with him in ascribing an important influence to moist air, and this appears to be due in part to the hindrance of terrestrial radiation of heat; and thus the prevention of frosts upon clear nights in summer, as well as to the more obvious effect which a higher percentage of aqueous vapor must have upon the growth of vegetation.

Nature has provided some tree seeds with migratory facilities that will bear comparison with that of our most noxious weeds. Some of the Poplars, and especially the Cottonwoods, may scatter their seeds many miles away in a gale of wind. They will spring up in a freshly exposed soil upon the prairies, far from any groves of these trees, along railway cuts and in plowed fields, that present the conditions favorable to their growth, at the time when they fall. May we not attribute the fact of their not appearing sooner and more generally upon the prairies, to the circumstance that the surface gets sooner occupied by the grasses and other herbaceous vegetation, so that their germination is prevented? There can be no doubt but that in most regions, and especially throughout the Northern States an abandoned field will become covered with grass and herbage much sooner than with bushes and young seedling trees. Besides spreading in their roots, the number of seed-bearing plants is infinitely greater upon an equal space of ground. They generally bear seed annually, and although it is shed much nearer to the surface, it still has a fairer chance of being borne to some distance by the winds.—EDITOR.]

FORESTRY.

Report of delegation appointed to attend the American Forestry Congress, held at Cincinnati, Ohio, April 25th to 29th, 1882, and subsequently at Montreal, Province of Quebec, August 21st to 23d, 1882.[1]

THIS document, forming an Appendix to Report of Fruit-Grower's Association, contained an account of the proceedings of the two meetings mentioned, the addresses delivered, and the principal papers read, some of them being given only by summary. The Delegates present the following conclusion, as the result of their observation, that will be read with interest:

"The Delegates, in view of the information obtained at the several meetings of the American Forestry Congress, beg leave to make the following recommendations:

"I. That such of the public lands as are more suitable for the growing of timber than for agricultural purposes, be retained by Government as a part of the Public Domain.

"II. That within this timbered tract, scattered portions be leased to persons suitable to act as forest police, to protect the timber-lands from trespass, guard against fires, remove fallen timber, and act under instructions.

"III. That no trees shall be cut, whether Pine, Spruce, Hemlock, or hardwood, on any of the public lands, under fourteen inches in diameter at the stump.

"IV. That no cattle, sheep, or swine, be allowed to roam at large in any of the public woodlands.

"V. That the lighting of fires in or near any woods from May to October, inclusive, be prohibited under severe penalties.

"VI. That a general stock-law be enacted, prohibiting cattle, sheep, and swine from running at large in any part of the Province, unless the municipal council of any municipality shall pass a by-law authorizing their running at large in that municipality.

"VII. That encouragement be given to farmers to plant timber lots of not less than ten acres on each farm of one hundred acres, and maintain the same as a timber lot, from which cattle must be carefully excluded. Such encouragement may be given by exempting the timber lots from taxation so long as the same are maintained and properly cared for.

"VIII. That encouragemont be given to farmers to plant and maintain shade-trees along the public highways and the boundary lines of farms, by granting out of the Provincial treasury a sum of ten or twelve cents for each tree so planted and maintained in a healthy and growing condition

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(1) Printed by order of the Legislative Assembly, Toronto, 1882. 8vo. p. 140.

for a period of five years, provided the municipal council of the municipality in which they are growing shall have granted a like sum.

"IX. That hereafter it be a condition in all sales or grants to settlers, that not less than twenty-five acres in every hundred shall be forever kept as woodland, under penalty of forfeiture of the whole, and that the covenant be made to run with the land.

"X. That scientific and practical instruction in Forestry be given to the students at the Agricultural College.

"XI. That a competent conservator of forests be employed, with a sufficient staff, and clothed with adequate powers to see to the proper execution of all laws relating to the cutting of timber, lighting of fires, running at large of animals, etc., within the timber-lands of the Province.

"XII. That as soon as practicable the management of the public forests be assumed by the Government; and all timber be cut and sold, trees planted, pruned, and cared for, and all matters relating thereto be conducted under the supervision of a Chief Forester.

"XIII. That the grounds of the several public institutions be utilized as far as practicable as experimental stations, by planting thereon timber trees that promise to be of practical value, and testing their adaptation to these several localities.

"XIV. That Government cause maps to be made of each county, showing the area that has been cleared off, that has been destroyed by fire, and that is yet covered with timber, and indicating as far as practicable the quality of the standing timber.

"XV. That a forest of acclimation be established at the Agricultural College, Guelph, in which shall be planted such forest-trees of other countries as may probably become acclimated in this country, and prove to be valuable for economical or ornamental purposes.

"All of which is respectfully submitted.

"D. W. Beadle,
"Wm. Saunders,
"Wm. Brown,
"P. C. Dempsey,
"Thos. Beall."

FACTS ABOUT FORESTRY.

By the late LEONARD BACON HODGES, of St. Paul, Minnesota.

THE recent death of the author of this article (condensed from *The Pioneer Press*) renders it proper that we should in this connection present a brief notice of the life of this enterprising and intelligent advocate of Forestry:

Mr. Hodges was born in Bloomfield, Ontario Co., N. Y., July 15, 1823, and was the son of Dr. Davis L. Hodges, his mother being a sister of the Rev. Leonard Bacon, D.D. When thirteen years of age he left home, and after a time spent in a book store, in New Haven, and some months in an academy, where he gave special attention to surveying, he engaged in teaching, farming, and other pursuits. About 1845, he came to Rockford, Ill., and some time after to Wisconsin and Iowa. In 1851, he was appointed United States Deputy Surveyor. In 1854, he settled in Minnesota, and in 1870 was elected to the State Senate, upon an anti-monopoly platform. In 1872, he settled in St. Paul, and about this time began to take a deep interest in Forestry.

In 1876, the State Forestry Association was organized, largely through his efforts, Gen. George L. Becker being the first president, and he being the secretary. He held this office till January last, when Mr. J. Fletcher Williams consented to assume its duties, with such aid and advice as Mr. Hodges might render. He prepared the original draft of the Timber-Culture Act, and for the rest of life was deeply interested in the promotion of tree-planting wherever an opportunity offered. He was especially engaged in demonstrating the utility of planting wind-breaks along railroads, and in the winter of 1881–2 was appointed superintendent of planting along the line of the Northern Pacific Railroad in Minnesota and Dakota.

In 1880, he prepared a little work of 176 pages, entitled "The Forest Tree Planter's Manual," of which large editions were printed at the State expense, for free distribution by the State Forestry Association. At its recent session the State Legislature provided for the issue of a new edition of this excellent work.

Mr. Hodges died at St. Paul, April 15, 1883, after an illness of some weeks, originating in an enfeebled condition of the digestive organs, but which did not present alarming symptoms until a few days before his death. The following article was read at a meeting of the State Horticultural Society:

Accepting an invitation of the Minnesota State Horticultural Society to address them on the subject of Forestry, I offer this paper. No economic question of the present has a greater bearing on the future well-being of the State than Forestry. I use the term "State" in its broadest sense. The old-fashioned word, Commonwealth, is more significant, inasmuch as on its broad face it suggests the idea that there is a species of wealth that can be enjoyed by all the citizens of the State. The wealth of Forestry, with attendant comforts, is of that kind, and its blessings reach out beyond the immediate control of the legal proprietor of the forest, and embrace within its ameliorating influences his more immediate neighbors, whether friends or foes; and so, as the good work goes on from one neighborhood to another, the actual wealth first developed by a few, to a very large extent, becomes the common wealth of the many.

The pioneer farmer out on our oceanic prairies, who surrounds his quarter section with a broad belt of forest trees, protects not only his own fields and crops from the damaging effects of storms, but also to a great extent protects his adjoining neighbors, who in common with him enjoy the wealth he has developed, and he can no more prevent them from the enjoyment thereof, than from the benefits of sunlight or rainfall, which are the common wealth of all of God's creatures. Hence I take the ground that it is not only eminently proper, but that it is the duty of the State, in every suitable way, to aid by appropriate legislation in the development or creation of this kind of common wealth. Further on in this paper, if I find I have room, I shall advert more fully to the pressing necessity of State and national legislation for the protection and encouragement of Forestry, and if I succeed in stirring up the whole legislative menagerie to a realizing sense of their duty in this behalf, I shall feel that I have not lived in vain. Forestry, in its true sense and meaning, as I understand it, consists in the planting, cultivation, and management of larger areas of ground than has been attempted; in the rearing of long lines of wind-breaks or belts of forest timber, so arranged as to arrest the force of prevailing winds; in the care, protection, and preservation of our native forests, and in encouraging and assisting nature in the rehabilitation of extensive tracts of original forests that have been destroyed by fire, and where, phœnix-like, a new crop of forest trees is springing up from the ashes. In its broadest sense its scope is larger, but so far as we are practically concerned, this is about the size of it. The development of new forests and the preservation of the native forests in Minnesota are the particular subdivisions of Forestry which more nearly concern us. Geographically located as the State of Minnesota is (on the eastern border, and including within her boundaries a portion of that immense interior treeless region which stretches from the southeastern limit of Staked-plains, in Texas, to the Saskatchewan, and nearly to Hudson's Bay on the North—from Eastern Kansas and Nebraska, Western Iowa and the Big Woods of Minnesota on the east, to the foot-hills of the Rocky Mountains on the west—practically taking in 20 deg. of latitude and 10 deg. of longitude—in round numbers covering 1,000,000 square miles, or 640,000,000 acres—enough for 4,000,000 farms of 160 acres each, and room for 20,000,000 of people), the subject under discussion is necessarily one of great local interest in Minnesota, as well as the nation at large. This vast "interior" is practically treeless. The exceptions are portions of the coteaus in the vicinity of the Sisseton Reservation, the Black Hills, Turtle Mountains, Pembina Mountains, and narrow strips and small groves along some of the water-courses and lakes—in comparison with the whole, hardly enough to swear by.

(To be continued in the next number.)

IN printing the names of members of the *American Forestry Congress* in pamplet form, the following names were accidentally omitted:

Burson, D. C.,—*Philadelphia, Pa.*
Clarke, Robert,—*Glendale, Ohio.*
Comegys, Dr. C. G.,—*Cincinnati, Ohio.*
Coursler, Henry,—*Stout's, Adams Co., Ohio*[1]
Gano, John A.,—*Cincinnati, Ohio.*
McNamara, Thos.,—*Hartwell, Hamilton Co., Ohio.*
Miller, Jos. W.,—*College Hill, Ohio.*
Sohn, John Wm.,—*Hamilton, Ohio.*
Tice, Jerome,—*Elenor, Clermont Co., Ohio.*
Walden, Rev. John M.,—*Cincinnati, Ohio.*
Wright, Jos. F.,—*Mt. Healthy, Ohio.*

Mr. John A. Gano, mentioned on page 7 as elected treasurer, having declined, Mr. Geo W. Trowbridge, of Glendale, Ohio, was elected at the Cincinnati meeting, and held until his resignation at the Montreal meeting. Through an inadvertence this was not noted in the record.

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(1) Instead of the name given on page 43, second line from bottom, in first column.

MISCELLANY.

Forestry of the Niagara Section of Canada.—Under the pleasant motto of "Woodman Spare the Tree," Mr. J. R. Martin, of Cayuga, Ont., presented at the Montreal Meeting some suggestions applicable to a wide range of country in the Northern States and Canada, that deserve notice. After describing briefly the district particularly referred to in his paper, he says:

"For a large portion of the past half century this area contributed a large quota of the most valuable Oak and Pine timber. I can well remember an Oaken monarch of the finest, hewing 752 cubic feet of the most beautiful timber without a knot, and lordly Pines upwards of six feet at the butt, towering 100 feet and upwards, with a limit exceeded by nothing this side of the Rockies, the Oak seeking the Quebec and the Pine the Albany market. Reckless expenditure, the calls of commerce, the ravages of fires and worse of insects, have so completely denuded this once fertile source, that it is no longer self-sustaining, and large importations of Pine from the Georgian Bay section are now required to fill the wants of the farming community, to say nothing of the requirements of commerce and the calls of the cities. But though their great staples are gone, leaving a few noble Oaks and lofty Pines as monuments to ship-builders and others of the wooden walls of Old England, and the spars that carried her sails to every clime, much yet remains of the second class and minor kinds, now known as second growth, composed of Walnut, Butternut, Chestnut, Basswood, Beech, Cherry, Ironwood, Swamp and Red Oak, White and Shell-Bark Hickory, Rock and White Elm, now so extensively used for furniture, Hard and Soft Maple, and last but not least, the Ash, Black and White, the former the millers', the latter the farmers' friend. One variety of which, known as the Rim Ash or second growth, enters largely into and supplies so many of his wants. I might add many others to this list.

"This section being nearly all arable, the supply is now practically confined to the mountain slope, the river banks and a few acres on each farm, ornamental groves and fence-rows, where they constitute valuable wind-breaks, now so necessary for the salvation of the wheat crop and the protection of stock from the cutting northwest winds. And, while touching on fencing and wind-breaks, I trust I shall be permitted to introduce to the consideration of this Congress a plant, hitherto, to my knowledge, unused for the purpose, which, I conceive to be well adapted. I refer to the Prickly Ash, (*Xanthoxylum Americanum*). It is hardy beyond comparison, prickly as the Buckthorn, or more so,—so acrid that cattle rarely browse; it grows in every variety of soil, forming, when isolated, a considerable tree of the toughest order, for which reason it can be pruned high or low, thus forming a dividing fence, or highly protective one, and comparative wind- break.

"It possesses, however, one habit, which though slow is continuous, and which, I fancy, can be controlled without much difficulty (I refer to its tendency to tillering or lateral growth), by root-pruning, not much more costly than branch-pruning and by trenching on each side, thus adding to its height and strength, and the difficulty of approach by animals. I might also here mention the American Larch, so largely used for fence-posts in conjunction with the barbed wire. This tree is indigenous to the wet sands of Haldimand and Welland. The Poplar also now so largely used in the manufacture of paper is found yet in abundance in the rough and wet lands. I might also add to my list many trees more of ornament than use, such as the Tulip, the Red Flowering Dog Wood, the Sumac, so useful for dye-stuff, the Crab-Apple of exquisite sweetness of blossom compared with the acidness of fruit, Wild Plums of endless variety, and Hawthorn of all kinds, including some very fine specimens of the Cockspur, which grow freely and never mildew. The question now arises how best to conserve what we possess and to replace what we have lost. Two sources of supply are available in most instances, the speediest succors from the parent stock, which is the Hickory, Rim Ash, and many other valuable varities rarely fail under proper conditions. The latter are the slower seeding and replanting in which the Maple and Elm now take the lead. I feel I can not leave my subject without a few words on our now almost depleted forests, and to the eyes of the traveler are many instances causing a pleasing deception. We have every variety of the Apple, Pear, Peach, and Plum, Cherries and Grapes *ad libitum;* and shortly with our wines bid fair to rival the renowned Valley of the Rhine. I will conclude with the grasses, one species of which near akin to our ribbon grass, I have recently discovered growing most luxuriantly in some of our swampy creeks, and which I conceive may be found most useful as a filling to the semi-marshy places in our woodlands, rendering them less unsightly and far more healthful."

The Dry Rot.—Mr. W. McLea Wallbank, of Montreal, submitted at the Forestry Congress in August last, the following interesting facts concerning the Dry Rot:

"Within the last week, a case of extraordinary interest came under my notice. I was called upon professionally to examine the condition of a house on which considerable outlay had recently been made by the owners, on this account, and which again was showing symptoms of decay. Upon entering the basement, (which was a finished one) I noticed a close heavy smell, and on removing the sofa, I found the fungus, which I here produce and marked No. 1; it is cut out just as I found it. On examination of the floor beneath the fungus (which was of Red Pine and to all external appearances sound) I found it completely decayed except a thin outer skin. On removal of the floor, which was laid on scantling, I found the latter also completely decayed, a piece of which I preserved and marked No. 2. Upon taking off the skirting or base-board I found that the fungus-growth was extending into the laths behind the plaster, a piece of which I have here marked No. 3.

"I then examined other portions of the basement and found fungi in all stages of growth from mildew or delicate white vegetation to the leathery character here produced. The site turned out on inquiry to have once been low land, and had been filled in, forming what we term made ground.

"The conclusions I drew were as follows:

"*Firstly.* That in making up the ground, vegetable or organic matter was mixed with the other earth.

"*Secondly.* That its corruption, aided by heat and moisture, without ventilation, caused the fungi.

"*Thirdly.* That the germs of the said fungi may be carried to any part of a building without the necessity of actual contact, between sound and affected parts.

"The question then arises, what is the remedy to apply to prevent the growth and spread of Dry Rot?

"The remedy usually applied is to replace the decayed parts by new, but in this case I am informed, that the timber No. 2 was put in new and sound by a carpenter not six months ago. It would evidently therefore appear worse than useless to repeat the operation.

"What I propose to do in this case is, to remove the present joists, flooring, etc., and in short all material showing the least trace of rot, and to excavate, say, six or nine feet of earth, replacing same by broken stone, brickbats closely laid and grunted, with three of solid concrete over entire surface of same. On this I would place tarred Cedar scantlings to receive floor, and thoroughly ventilate the air space between the concrete and underside of floor. . . .

"I strongly believe in seasoning and ventilation, but we architects in this country adopt no process for the preservation of our timber, and, frankly speaking, have no guarantee that the timber used by our contractors has been thoroughly seasoned, and yet I must add that the fault is not altogether on our side, as our contracts constantly require us to erect buildings in the shortest possible time, and at the least possible cost."

The relation between Floods and Forests.—This subject deserves the most serious consideration, and in various foreign countries, the most disastrous inundations have occurred in recent times—quite as memorable in these countries as those upon the Ohio and other western rivers in our own. A letter from the British Consul-General at Florence, has been published, showing the fearful extent of damages done by floods in Northern Italy, during the last autumn, primarily due to heavy rains and rapidly melting snows—exceeding those of 1801, 1823, 1868, 1872, and 1879, which were memorable in the annals of disaster.

The Bulletin of the Triennial Society for the Promotion of Sylviculture in Italy, after stating some of the effects, says:

"The direct cause of the late floods, the unhappy effects of which will be felt for many years, was the heavy rain that fell on the Northeastern Alps, in the middle and latter part of September last, but the effects were greatly aggravated by the denudations of the mountains. From a well-wooded region the same amount of water would not have been discharged upon the plains with equal suddenness, as from a surface without trees. It is evident that, in a wooded region, a certain amount of water must be absorbed by the vegetation, while the remainder as it descends, does so less quickly, making a great difference in the volume of the floods."

After citing various Italian authors in support of this fact, it refers to the labors of reboisement undertaken in recent years by Austria, Switzerland, and France, and notices the example of the town of Varazze, on the Riviera di Ponente, as an evidence of the good results that follow from planting denuded slopes. The mountains above this town, in 1859, were entirely bare, as the neighboring heights still are. The land was owned by the Commune, and amounted to some 4,000 hectares, (9,880 acres), yielding little or no returns. The stream that flowed through the town, became a torrent, at every heavy rain, and sometimes threatened to destroy it altogether. The local authorities finally decided to dispose of their land in many small lots, some upon perpetual leases, and now the slopes are covered with the Stone Pine (*Pinus maritima*). The rains no longer cause the stream to swell, and the town is safe from inundations.

Dr. Macgowan, in a recently published letter, dated Hankow, Jan. 1, 1883, describing the recent flood of the Kiangsi and the Chêkiang rivers in China, traces the cause in part to recent clearings upon the mountains, which now discharge the water from heavy rains, almost as soon as it runs from the roof of a house, instead of retaining it in part, until it can be delivered in a moderated flow.

The Red Gum.—The following extract from a letter by Dr. Charles Mohr, of Mobile, addressed to the Hon. Van H. Manning, (M. C.) of Holly Springs, Mississippi, will give some additional information concerning this tree. After noticing that the *Red Gum* belongs botanically to the same species as the "Sweet Gum," (*Liquidambar styruciflua,*) he says:

"The difference between them

rests in the qualities of the wood; that of the Red Gum is of a reddish color, greater compactness, and is closer and finer grained, which may be caused by climatic influences, and the age of the tree.

"Attaining the size of the larger forest trees, from two to three and one-half feet in diameter, and from eighty to ninety feet high, it is one of the most common of the timber trees throughout the central and upper portions of the Gulf States, (Mississippi and Alabama.) There in the rich low bottoms along the larger rivers, with a deep cold loamy soil, it arrives at its greatest perfection. It may be said that on the bottom lands of the Mississippi and Yazoo rivers it is found in its best development and greatest abundance. A specimen of this timber exhibited at the Atlanta exposition had a label attached saying, "there are millions of feet of this in the Yazoo country." I can indorse this statement by my own observation in that region. The qualities of this timber are highly esteemed, it being of a fine grain, compact, but not too hard for working,—durable, of a pleasing color, and admitting of a fine finish. It is certain that for the manufacture of many articles of furniture, it takes a high rank amongst the hard woods. In view of its present abundance, and the increasing scarcity of the supply of Wild Cherry, Walnut, Ash, and other woods which furnish the chief supply for the industry, it is to be looked upon as one of the most important of the resources needed for these purposes. Whatever may be the objections to the use of the Sweet Gum grown in more northern latitudes, and of the younger growth, on account of its great liability to shrink, they lose their force in regard to the Red Gum. In my investigations of the forests and their products of the Gulf region made for the 10th Census, I have given this point particular attention. As stated in my report I found that planks from one and one-half to two inches in thickness and a length of twenty feet and over, have shrunk so little after an exposure of more than eight months to wind and weather (during the summer) as to be scarcely perceptible. To have the timber ready for immediate use, after its arrival from the mill, it is at the Mobile Furniture Manufacturing Factory, subjected to a process of seasoning in steam heated kilns. Subjected in these drying chambers, heated by a coil of pipe of one inch in diameter and a thousand feet in length, for several days in an atmosphere kept dry by constant condensation of the aqueous vapors thrown off, it is soon fit to be worked up in any shape and manner without danger of subsequent cracking or shrinking. The furniture factory at this place has chiefly been established for the utilization of this timber found on the Alabama and Tombigbee rivers, and their tributaries. It is chiefly used for turning work, bedsteads, washstands, etc., etc., which give much satisfaction. The enterprise here is in need and wants capital; however, it is well appointed and of considerable working capacity. I undersand that in Chattanooga, Tenn., there is a similar establishment using *Red Gum*.

"In the new industrial museum of the Department of Agriculture, Washington, D. C., arranged by me last summer, are fine specimens of this timber, to be seen amongst the woods of the Louisville & Nashville R. R. and Tennesse and Arkansas exhibits."

Tree-Planting in the District of Columbia.—Professor S. F. Baird, Secretary of the Smithsonian Institution, has issued the following circular. The suggestion is worthy of notice by those in charge of the public parks in our large cities:

"The Smithsonian Institution, in co-operation with the Biological Society of Washington, is making an effort to procure full statistics with regard to the trees, shrubs, and herbaceous plants growing in the public grounds of the city and suburbs. Your aid is respectfully requested in furtherance of this purpose. especially in preparing and forwarding to this institution a full list of all the species growing under your supervision. These returns should give the common, or if possible the botanical name, the place where specimen may be seen, the date of planting, with a notice of any trees or plants which have been acclimated here, and what changes, if any, they have exhibited, as well as such kinds as have been planted and resulted in failures from causes incident to the soil or climate. A distinction should be made of those most liable to be infested with insects, of emitting offensive odors, or of shedding unsightly offal on the walks. In order to trace the changes which have taken place in tree-planting in this District, it is desirable to obtain information as to what kinds were grown here soon after the permanent establishment of the Government in this city in 1800, and where specimens of these can now be examined. Note also any rare or remarkable trees, known to have stood in the public grounds, but removed during the extension of the public buildings or other improvements. Trees of great size or age or remarkable for their connection with public events, are regarded as monuments of interest to the general public; their locality, measurements, and general description should be given.

"In addition to such as are grown for ornament or shade in the public grounds, information is desired, with a list, of all greenhouse plants cultivated under your direction; and finally a notice of any recently introduced weeds or such as are detected occasionally or as not permanently resident. Desirable information upon this subject being contained in the publications which have been made here, a list of all books on botany, local floras, gardening, and vine culture which have issued from the press in Georgetown or Washington is specially desired.

"The information here called for will be published under the authoity of this institution for the benefit of Government employés, strangers visiting the city, for educational purposes, and in the interest of science."

Remarks Upon the Article of Mr. R. A. D. King.—Mr. M. C. Read, of Hudson, O., sends us a friendly criticism upon the leading article in our March number, in which he says:

"First, as to a single recommendation in the very excellent paper by Dr. King. I refer to his recommendation on page 245 of the rooting up and destroying 'profitless bushes' in places covered by them, and which it is proposed to plant with useful trees. It seems to me that this is not good advice. These 'profitless bushes,' if left to grow, will furnish just the protection which the valuable trees need in their early growth and even during their entire life. I have known valuable forest reserves practically destroyed by the careful cutting out of shrubs and 'worthless' trees. It enables the native grasses to gradually encroach upon the forest, making in the end a thick turf, preventing the downward passage of the water, inviting the intrusion of domestic animals, and followed by the steady dying out of the trees on the margin of the forest until it was quite destroyed. This undergowth, if undisturbed, holds all fallen leaves in place, prevents the flow of rain-water from the surface, favors the growth of mosses, and secures that humid condition which is essential to natural forest growth.

"Another suggestion as to the management of seedlings 'that have a strong tap root.' If we go into any forest where there are many young seedling trees, we will find some species that are essentially surface feeders. They can easily be pulled up by the hand without injury to their roots, and others, of no larger size, so firmly anchored that the strength of a horse would hardly suffice to pull them up. These are deep feeders, pushing their strong roots deeply into the subsoil. Now, is it wise to try to make them surface feeders? While the demand on the nursery men is for large trees, irrespective of their habits, they are compelled to transplant these deep feeders, cut off the tap root, and force the growth of laterals. The result is a less vigorous growth, a shorter life, and thus earlier fruiting, noted in the article referred to, which is an indication of impaired vitality. Is it not a better practice to grow such trees only one year in the nursery and then transfer them with the tap root unimpaired to the place they are to permanently occupy?"

[The term "*Lignum Vitae,*" as used on page 244, should have been noticed in its place for explanation, and it may perhaps be noted here as well as any-where. It is well known that it properly applies to a tropical species, the *Guaicum officinale.* Before the article was printed we addressed a letter of inquiry to the writer, and his reply showed us that the name is locally applied in his region to a species elsewhere generally called the "Iron-wood," (*Ostrya Virginica.*) He had, of course, the same right to use it as a popular name that the lumbermen of Maine and the Maritime Provinces have when they apply the term "Juniper" to the "American Larch," (*Larix Americana*). All English authors apply the term "Sycamore" to the *Acer pseudo-platanus*, while Americans as uniformly apply it to the *Platanus occidentalis.* In fact there is no source of error in Forestry more common than the use of common names, and we have had for several years under preparation, a card list of these as we came across them, and could fix their certain meaning by their proper botanical names.

We would be much obiged to our readers for notices of any such as may appear exceptional or local in their use, and may some day be able to give them to the public in connected form.—EDITOR.]

The Tree-Culture Act in Nebraska.—We copy from the "*Pioneer Press,*" of St. Paul, Minn., the following extract of a letter from Mr. James T. Allan, of Omaha, upon this subject:

"On the prairies of the West is where exists the great necessity of forests, and where the benefits of the timber-culture act is felt. Nothing is more important to increase the quantity of crops, to prevent the evaporation of moisture, ameliorate the climate, and afford protection for man and beast, both in winter and summer. There will no doubt be an effort made in Congress to repeal the timber-culture act. Mr. C. S. Sargent in the *North American Review*, says: 'It has failed entirely in accomplishing what was honestly expected; it has given rise to gigantic frauds, and encourages the planting of trees where trees can not grow unless artificially irrigated, etc.' In regard to the working of the act in Western Nebraska, as far west as the 100th meridian and beyond, the writer has given personal observation, and the practical results of planting trees on timber claims differ widely from the foregoing statement. In Buffalo (200 miles west of the Missouri river) and adjacent counties there are at least 500 quarter sections where groves of from five to thirty acres have been planted on time entries, and are growing well. On many of these are thousands of trees thirty to forty feet in height and from eight to ten inches in diameter, grown from sprouts and seeds since the act became a law in 1873. Hundreds of instances might be given similar to the following: One man in Dawson county, near the 100th meridian, where wiseacres a few years ago fixed the western limit of rainfall, has thirty acres of Cottonwood on his claim, where the law only requires ten. These trees are thirty feet high, planted in rows north and south half a mile long. Within a mile is a solid tract of twenty acres of Box Elders, twelve feet high, grown from the seed sown where they stand, and in half a day's ride ten claims were passed, all the young trees showing a good growth. Still further west, and beyond that imaginary rain-line, numbers of timber claims were found, and the trees were as flourishing as those 250 miles eastward. Col. J. R. Roe, of Kearney, commenced in 1875, and has now 45,000 trees of Cottonwood, Maple, Ash, Walnut and Box Elder, of all sizes up to forty feet high and thirty inches in circumference, enough to keep two or three families in fuel, and the trees are worth three times the cost and labor of planting. The man who says trees will not grow on the prairies, and grow just as well as corn or potatoes, is willfully ignorant of the facts. What has been said about the western portion of Nebraska is true as to the whole State, as well as those sections of Kansas and Dakota which have been settled since the act became a law, and it was one of the greatest benefits ever conferred upon the prairie country. There is no more land stealing under this than there is under the homestead act, and as far as it applies to citizens, it is much more general in its benefits. The latter requires the claimant to live on the land for a term of years before he can obtain a title.

"The timber claim is open to the doctor, the lawyer, and, in fact, all classes of citizens, the only requirements being that ten acres of the land should be plowed, cropped, and planted with trees; that they shall be cultivated and protected, and if this is not done no one can get a title. Many are plowing a strip around a quarter section and planting, which is a great advantage to the adjacent lands, preventing the force of the wind and driving snow. Others who have claims in connection with homesteads are putting the whole into timber and seeding with tame grasses, combining protection and winter pasturage. Some may say the doctor or the merchant has no right to the benefit of this act, but it might be difficult for them to tell why the mechanic, the hired man or the hired girl should not have a square piece of the public domain which is offered, if they comply with the terms and plant trees. In ninety-nine cases out of a hundred where a new settler in a town, no matter what his occupation, takes a timber claim he becomes interested in getting what he has looked forward to—the possession of real estate and a future home. This makes him a permanent settler, and any one who knows any thing about the settlement of new western towns knows there is a great difference between a fixed settler and one who is liable to drift about according to fancy or circumstances.

"Upon inquiry I find that a large number of timber claims are taken by townspeople, who pay the farmer settlers near by for the breaking, plowing and cultivation, planting and protection against fires; by this both parties become interested and benefited by the transaction. In the Niobrara, and districts in the northwestern part of the State, 400,000 acres are entered, and 200,000 in the adjoining Neligh district, under the lumber act. Ex-Gov. Furnas, in a recent address before the National Agricultural Convention, estimates the total number of trees planted in this State from 1854 to 1882, inclusive, at 403,000,000. The whole West is interested in the continuation of the timber-culture act. It should not be repealed, but perhaps amended so that a tract once filed on, though the entry might be canceled for non-fulfillment of the law, still it should always remain for the purposes of timber culture, and not be open for homestead entry or pre-emption."

Petition of the Ohio Forestry Association to Congress.—The State Forestry Association of Ohio, through Senator Pendleton, have petitioned Congress for the free admission of lumber into the United States. The argument used in favor of this is that "our forests are being too rapidly destroyed, that the duty imposed upon lumber comes off the class that needs relief, the common people, the consumers, and is to the injury of the people at large, and induces the lumbermen to make further inroads upon American forests. The object is, by impeding foreign competition, to enable lumbermen to cut and saw at a tempting profit, to protect and encourage the manufactures of house furniture and cabinet ware, but to encourage the more rapid destruction of the forests within our own boundaries. In other words, we pay to the lumberman a premium for the devastation of our country. It is wiser to pay a bounty to every importer of sawed boards and hewed timber rather than impose a duty upon these articles, as has been recommended. The entire supply of White Pine in the United States will only meet the present demands for eight years. The efforts of the Forestry Association have been recognized by the President of the United States, and its work encouraged in his message. A tariff upon Canadian lumber imposes a grievous burden upon the people, with no corresponding benefit, but with a prospective loss, which must very soon make us dependent upon the foreign supply, and place us at the mercy of any export duty which a foreign government may choose to assess. The efforts of all Forestry associations can be of little avail if the tariff upon foreign lumber be continued."

A French Idea of the Future of America. — The amusing absurdity of the following extract from an item given in the *Revue des Eaux et Forêts*, of November last,—which is of course intended as a satire, but is said with all the gravity of sober earnest,—will be enjoyed by those best acquainted with the situation. After noticing the manufacture of boards from straw, which has been mentioned in many of our newspapers as a novelty worth speak-of, it says:

In the United States, straw is never used, as with us, for litter or manure. The Yankee farmer never fertilizes his lands. When they are exhausted, he abandons them and goes in quest of others in Kansas and the Far West. The straw after threshing being looked upon as an incumbrance, is burned, and the ashes are scattered over the fields.

This practice explains how it happens that they have come to make, from a worthless product, sheets which would sell here for a higher price than real wood, although it is neither as light nor as elastic. We use our straw for a better purpose, to keep up the fertility of our land, and we cultivate forests, to obtain the wood that we need. The future will prove which is right: the Old World, which gives back to the soil that which it has reclaimed from it, or the New, which cultivates it till spent. A time may come when the New World will yield neither wood nor straw, and then, Messrs. American Farmers, you will no doubt come to get them from old Europe. But as that time is still distant, they will continue their work of destruction, to the national cry of *Go Ahead!* Courage, Brother Jonathan!

Fruit Growers' Association of Ontario. —The programme for the session held Jan. 31–Feb. 1, 1883, at Toronto, shows that Forestry holds a place in their proceedings. One of the questions for discussion was:—"The best method of awakening a general interest in practical Forestry." Another was,—"The best varities of Forest Trees to plant for ornament and for profit;" and another, "How can we induce farmers to plant trees along the roadside."

This society includes several active members of the American Forestry Congress, and they very justly appreciate the close relation that exists between Fruit-growing and Forest-tree culture.

Catalpas and Cottonwood in Kansas.— My experience in planting here has led to the conclusion that two-year old trees—Catalpas or Cottonwoods, with properly trimmed tops and roots, and planted as *deep* as each tree will permit, (the deeper the better) —are less liable to be affected by the drouth the first and second seasons, till they are well established, and are best able to stand their own part with weeds and dry spells. Clean cultivation is of the utmost importance. Thus far, I prefer the Catalpa to the Cottonwood or any thing else that has been tried.—*J. B. Weaver*, Vosburgh, Stafford Co., Kansas.

THE

AMERICAN

JOURNAL OF FORESTRY.

JUNE, 1883.

TO THE PATRONS OF THE AMERICAN JOURNAL OF FORESTRY.

This Journal was commenced under the belief, that there was a demand for information, and for the interchange of views upon the subject which it is its province to discuss,—and that the interest manifested in this subject at the Meetings of the Forestry Congress at Cincinnati and at Montreal, in April and in August of last year, was sufficiently widespread and real to warrant its publication.

The previous subscription list obtained, and the words of encouragement coupled with promises of aid heard from many persons prominently interested in Forestry were thought sufficient to justify a beginning. An edition of several thousand of the first number was printed, and copies with circulars inviting subscription were sent to every person known to the editor or the publishers as interested in the subject of Forest conservation and tree-planting, or in the scientific, economic or practical questions which this involves. The publication was liberally and favorably noticed by the press, bringing it to the knowledge of many who were not thus reached, and who would be presumed to take an interest in the subject.

The result has been a subscription list considerably less than is needed for paying the actual cost of publication. This presents the practical question, which must be settled before the beginning of another year in October next:—*Shall the* AMERICAN JOURNAL OF FORESTRY *be continued?*

In the few instances in which this subject has been recently mentioned in private correspondence, a strong feeling in favor of continuance has been shown, in words like these: "I will send you ten new subscribers," —or—"Call attention to the subject in the JOURNAL, and ask its friends to sustain it, by increasing the subscription list." Acting upon the latter suggestion, we present the question to our friends and patrons. If, before the end of the present volume, a *bona fide* subscription list is obtained, sufficient to justify continuance by *paying cost*, it will go on. If not, it must stop at the end of the first year. The deficit is made greater than it should be by the non-payment of many subscriptions. It is hoped that those who have not paid, will now promptly remit the amount to the publishers. The back numbers can all be furnished to new subscribers.

NOTES ON SOME LITTLE KNOWN FLORIDA TREES.

By W. W. CALKINS, of Chicago, Ill.

DURING seven winters spent in Florida, the arborescent vegetation of that State has engaged my particular attention, in connection with explorations among the humbler forms of plant-life. The result of my labors has been a large accumulation of species, fortunately supplemented by the addition of the six valuable "Fascicles" and the rare collection of Florida "woods," numbering one hundred and eighty-six species, made by my friend, A. H. Curtiss, Esq., who is too well known as a botanist to need an introduction here. With this material before me, in connection with my own personal observations on the ground, I may claim to know something about the subject under consideration. The fact that, of some four hundred and twenty species of trees in the United States growing to *tree size*, over *two hundred* species are found on Florida soil, leads us to conclude that in so large a number there must be many rare and useful forms. The Pine, Gum, Live Oak, etc., are well known. I may speak of these and other common species hereafter. In the course of my explorations on the Keys, in the "Everglades," along Indian River, and among the Pines of the interior, I have remarked, time and again, the *abundance* of trees of certain species peculiar to the sections named, which, could their products be marketed at the North, would be of great value in some branches of manufacture; as, for instance, in fine cabinet work, in making paper pulp, etc.

The usefulness of the Cabbage-Palm (*Sabal Palmetto*), has been fully demonstrated already. This species is well known to every tourist on the St. Johns. The supply can not be exhausted for many years. The leaves of the Scrub Palmetto (*Sabal serrulata*) are also largely utilized. This can hardly rank as a tree, the trunk lying prone on the ground or below the surface. The botanists call it a *stem*, but I claim it has a *true trunk*, though its habits are degenerate.

The Royal Palm (*Oreodoxa regia*), is only found in far Southern Florida, and not abundantly. Curtiss saw trees, with trunks straight as an arrow, one hundred and twenty-five feet in height. The outer wood is highly prized for making ornamental articles. The Brickly Thatch and Silver Thatch (*Thrinax parviflora* and *T. argentea*), are also valuable for their rarity. The former grows thirty feet high, or more, while the trunk will be uniformly from two and a half to not more than four inches in diameter. The Cocoanut Palm (*Cocos nucifera*), now naturalized and profitably cultivated on the Keys and mainland, is well known. The Thrinax and Royal Palm are peculiar in Florida to the almost inaccessible fastnesses of the Everglades. The Red Mangrove (*Rhizophora mangle*), has a hard, compact, and reddish wood, which takes a high polish. It grows, in some localities, to a large size. The supply is inexhaustible among the Keys and along sea-washed shores and inlets. The Black Mangrove (*Avicennia nitida*), is also a fine-grained wood of value. I have seen it on Indian River forty to fifty feet high, and with a trunk a foot or more in diameter. The White and Black Buttonwood (*Conocarpus erecta*) and (*Laguncularia racemosa*), are valuable at present for fuel and constitute the main supply of residents on the Keys. The hearts would make fine ornamental work. The Sea Grape (*Coccoloba uvifera*), is a low-growing tree of considerable size, bearing berries of an agreeable taste. The wood is hard, dense, finishes highly, and makes fine work. It frequents the inlets, and is very abundant on Indian River, where I obtained specimens. The Cinnamon Tree (*Canella alba*), is chiefly valuable in medicine. My specimen, from Curtiss, shows a diameter of seven inches. The Quassia, or Bitterwood (*Simaruba glauca* and *S. amara*), are elegant trees. The first that I saw was on Indian River, and forty feet high, with a trunk ten inches in diameter. The foliage is fine and the wood close grained. Its medicinal properties, which are similar to quinine, are well known. In the same locality as the preceding, and elsewhere, grows the West Indian Birch (*Bursera gummifera*). This tree grows to a large size. The fruit is agreeable and the gum valuable. Among the *Ironwoods* are many fine species. The Nakedwood (*Eugenia dichotoma*), the White Stopper (*E. monticola*), the Red Stopper (*E. procera*), and others, are all capable of usefulness. The Satinwood (*Chrysophyllum oliviforme*), has not only a beautiful golden foliage, resembling *satin*, but the wood is fine grained and finishes well. The tree is, in Florida, of small size, but somewhat abundant. The Torchwood (*Amyris sylvatica*), though small, deserves notice. The wood is close grained, and polishes highly. It will burn like tinder. The natives call this *Frankincense wood*, on account of its pleasing fragrance. The Lignum Vitæ (*Guaiacum sanctum*), grows in Florida, though sparingly. The Ironwood, or Hornwood (*Condalia ferrea*), for compactness, hardness, and weight, eclipses all the species that I have seen. I have specimens which, fresh from the saw, look as though carefully polished. This is a valuable wood. The Mahogany (*Swietenia mahogani*) is another rare tree of Florida. There are several species called "Crabwoods" by the residents. The one known as *Schaefferia frutescens* is most valued on account of its high finishing qualities. The Manchineel (*Hippomane mancinella*) grows on Bahiahonda and other Keys. I do not regard it as of commercial value, and have undoubted evidence of its poisonous properties, in even attempting to work up the well seasoned trunk. The Joewood (*Jacquinia armillaris*) is curiously veined. The Bustic, or Red Stopper (*Dipholis salicifolia*), the Mastic (*Sideroxylom Mastichodendron*), the Lancewood (*Nectandra Willdenoviana*), the Wild Tamarind (*Lysiloma latisiliqua*), and the Tallowberry (*Byrsonema lucida*), all have commending qualities. The foregoing comprises only a part of the rarer trees of Florida.

It will be seen that all are tropical, or sub-tropical, species. Most, if not all, are common to the West Indies. The contiguity of the peninsula to those islands, its latitude, climate, and soil, will answer for their flourishing growth. The question as to the presence of so many species can be accounted for without supposing former geological conditions connecting the two countries. Day after day, and week after week, I have wandered along the shores of the keys and mainland, and almost every wave would throw at my feet fruits and nutlets of species I recognized at once as West Indian, I need only mention the well known Sea Bean (*Dolichos pruriens*), the Gray Nickar (*Caesaplina Bonduc*), the Cocoa Nut, and the Tamarind, as examples. The inter-oceanic currents, the tidal waves and winds, and birds of passage, are the effective agencies of transportation. We may be thankful that we have so many rare species in our own country. In due time they will be appreciated, and like one of them—the Royal Palm—jealously guarded, and like that tree protected by legislation. The knowledge and untiring industry of Mr. Curtiss has more than doubled the number of West Indian trees before known to exist in Florida, while it is probable that some more may yet be added. I will add here *Simaruba amara* (Quassia), before mentioned. The other species is well known.

ULMUS CRASSIFOLIA—(*Nutt.*—CEDAR-ELM.)

BY PROF. S. B. BUCKLEY, PH. D., OF AUSTIN, TEXAS.

THIS is the most widely diffused and abundant elm in Texas, extending from the Red River, at the north, southward nearly to the Gulf of Mexico, and from Eastern Texas westward nearly to the Rio Grande. It also occurs in Louisiana, west of the Mississippi, and in Arkansas and the Indian Territory. It was first discovered by Nuttall, on the plains of the Red River, about 1,100 miles above its junction with the Mississippi River. He describes it in his supplement to "Michaux Sylva," as "a majestic tree of the dimensions of an ordinary oak." It is most abundant, and attains its largest size in valleys and near streams. Its leaves are mostly from one to one and a half inches long, by from one-half to one inch wide. On young, growing branches the leaves are sometimes three inches long and one and a half wide, doubly denticulate or subcrenulate, pubescent on veins beneath, larger veins prominent and running in nearly parallel lines to the edge, petioles short, seldom more than two lines long. Leaves and smaller branches thickly placed, forming a dense shade, more dense than any other American elm. In Texas it attains a diameter of three feet or more at three feet from the ground, and a height of from seventy to eighty feet. Its bark is a light grey, sometimes deeply furrowed, but generally slightly so, and sparingly scaly. Wood, light chestnut brown and close grained, hence its common name. Used for rails, the frame-work of houses, and its larger limbs for the frame-work of the Texas or Mexican saddle. It makes an excellent fuel. According to Mr. S. P. Sharpless, special agent in charge of the chemical and physical work of the Department of Forestry of the U. S. Census Bureau, it has an average specific gravity of 0.7245, an average per cent of ash 1.20, weight of a cubit foot in pounds 45.15, and an approximate fuel value of 715.09, as published in "Forestry Bulletin" No. 22, of Prof. Sargent.

It is well worthy cultivation, decidedly more so than many trees planted for ornamental purposes in the Southeastern Atlantic States. I think it by far the most beautiful of elms. Its northern localities show that it will endure a cold of 10° or more below zero. It would probably thrive in most of the region southward of the Ohio River and east of the Mississippi, where it has not been found native.

Unlike other elms, it has flowers and seeds in August and September. Its seeds are abundant, from which it is easily propagated. It is one of the first to put forth its leaves in spring and one of the last to shed them in winter, hence, in this climate, it is almost continually beautiful.

FACTS ABOUT FORESTRY.

By the late LEONARD BACON HODGES, of St. Paul, Minnesota.

(Continued from page 376.)

WITH such a neighbor adjoining and flanking us in the rear, I have often thought, while traversing the great prairies of Dakota, that, for all practical purposes, she was a part of, or, at the furthest, simply a suburb of Minnesota; and it is extremely difficult for a Minnesotian to talk Forestry without taking cognizance of Dakota as a prominent factor in the solution of our own Forestry questions. Not only Dakota, but her adjacent neighbor, Manitoba (the Prairie Province), with the vast outlying prairie region stretching west and northwest to the foot of the Rockies—all that open region through which the fierce blasts of the polar regions find unobstructed passage, culminating in Minnesota "blizzards;" and, in the other direction, the vast prairie, arid region of the southwest, whence come the simoon-like winds, so withering and antagonistic to growing crops, forest culture, and human comfort—all these are factors not to be ignored. They force themselves upon you, as horticulturists, as your most bitter, determined, uncompromising foes; blasting your hopes, destroying at one sweep the results of years of patient toil, confounding your calculations, and, every now and then, setting you up on your beam ends in the most unexpected manner. The prairie farmers suffer from the same causes to an equal, if not greater extent than yourselves, and their misfortunes entail corresponding disasters upon our commercial and manufacturing interests. Now that we have finally settled our old railroad bonded indebtedness, and on a basis satisfactory to our creditors, the enemies of Minnesota have nothing left them to harp on but our climate, and even that we can so modify by tree-planting as not only to "temper the wind to the shorn lamb," but disarm our enemies of their last remaining weapon. These elemental forces are undoubtedly all right, and play an important part in the economy of nature. We have only to guard against them when on the rampage, and, in doing this. Forestry is the prime factor, the central figure, in the whole business. I have neither time nor patience to even attempt to answer the puerile arguments and unfounded assertions that trees won't grow on our Western prairies. Life is too short to fool any portion of it away in that direction. Facts, not theories, claim our attention. The fact that, within the last ten years, hundreds of groves, containing millions of healthy, vigorous young forest trees, are now growing far out in the treeless region, where science had pre-ordained and doomed the work an impossibility, must be acknowledged. The fact that young groves of forest-trees are now being successfully grown on the line of the Northern Pacific railroad, away out and beyond the 100th meridian, has also got to be admitted, science and its votaries to the contrary notwithstanding.

Where weeds and grass will grow, there forest trees can grow; and where they grow, the more agriculture will succeed; and the better you know how to do your work, the larger the measure of your success. I am assured that I am expected to give a good deal of this sort of knowing how to do it in as few words as possible. Having written and spoken so much on this matter, and time and again reiterated the same instructions, it seems to me unnecessary to again repeat what has been so often said by myself, and has also frequently been better said by others. Like Thrice-Told Tales, I am sometimes weary with the hearing of it; and when I am asked by apparently intelligent men if trees will really grow out on those great prairies, I feel very much as the preacher did, who, after having devoted the best part of his life to the faithful preaching of the gospel, was astonished one day by one of his congregation asking him if it really was a fact that Christ was dead.

Preparation of the soil.—This is the first thing to do, and is of paramount importance. Unless properly done, failure is the rule—success the exception. Get your ground in condition to produce a rattling good corn crop, and you have taken a long step in the right direction. In order to do this, in commencing *de novo*, break the prairie sod in June. Break it about three inches deep. Be vigilant and careful in this very important preliminary work. See that your breaking plow is a good one. Adjust it so it can't help but do good work. Keep the lay sharp. Draw it out every few "bouts" by hammering. Use the hammer on the lay freely, and only use the file for putting on the last touches. Should the ground be at all rocky, put a man with a pick and spade to remove the rock ahead of the breaking plow. Should you make a "balk," back up and take it out. In finishing up the "land," don't leave a strip of unbroken prairie from six inches to two feet wide, as many do, but clean out your "dead furrow" so thoroughly that no green grass is visible in it. Having done this, nature then steps in, and the process of the decomposition of the tough prairie sod commences. Usually by the middle of the ensuing August the sod has so far decomposed that you can commence "back-setting." This can be done with your breaking plow, unless the gauge-wheel prevents the plow from running deep enough. If so, change it for the strongest stirring plow you can get. Commence "back-setting" at the dead furrow, throwing your furrow in and toward it, and bring up three or four inches of fresh dirt. Simply turning over the sod is of no account, and is worse than useless. It is full as heavy work to "back-set" properly as to break, and it costs as much to do it. You have now laid a substantial foundation for success, and it will be good practice to let the ground rest till the following spring, that the action of the elements may step in and aid you in the process of disintegration. Then commences harrowing, and harrow "till you can't rest." By this time, unless it is a peculiarly perverse piece of ground, you have got it pretty thoroughly "bulldozed," and if you are in no urgent hurry to get your trees planted, plant the ground to corn or potatoes, the thorough cultivation of which leaves the ground in excellent condition. If you can't plant to some hoed crop, you can sow it to small grain; and in doing this you can not be too careful in procuring clean seed, for an almost imperceptible amount of "foul stuff" is sure to entail a vast amount of labor in its extermination. After the crop is off, again plow the ground as deep as you can afford to, bringing up more new dirt. There is no possible danger of plowing too deep for forest trees. In this, the danger is all the other way—in shallow plowing. If you are not so situated as to cultivate to crop, then summer-fallow the ground, to be planted the coming fall or spring.

When to plant is now the question. Either fall or spring, which? Could I predict with any certainty what the weather would be for six months ahead, I could answer this question positively. Without this positive knowledge the best I can do is to present the "pros" and "cons," leaving you to assume the responsibility to go ahead on your own judgment. If fall planting is preferred, don't begin until the frost has killed the foliage. In our latitude about the first week in October is early enough to commence, and you can keep on planting till the ground freezes up. If spring planting is preferred, begin as soon as the frost is out deep enough and the ground in good working condition. One year with another, the entire month of May can be devoted to planting forest trees in Minnesota or Dakota. The advantages of fall planting are chiefly in the fact that the ground becomes firmly packed among the roots of the young tree to the exclusion of the air, and that it is in better position to appropriate the moisture resulting from the winter snows and early spring rains, getting thereby such a "send off" as to enable the young tree to successfully go through a dry spell that would be very damaging, if not fatal to spring planting. Such dry spells do occasionally prevail all over the Northwest about planting time, and hang on most unmercifully. On the other hand, an open winter, with frequent or occasional thawing or freezing, occasionally proves fatal to fall planting, the action of frost heaving the fall-planted seedling or cutting nearly or quite out of the ground. Where well rooted young trees are used, we overcome this trouble to a great extent by deep planting. While spring planting escapes this danger, it is in bad shape to withstand a protracted drouth ; and right there is where fall planting has the inside track. But should your spring planting be followed up by occasional timely showers, the newly-planted trees grow right along with great vigor. The tree planter must take his chances. I have for many years planted largely both spring and fall, and my experience does not yet justify me in bringing in a virdict either way. In fact, I consider it one of the least important of the many conundrums of Foresty.

The handling of young trees before planting is an important matter, and deserves a passing paragraph. You will not be greatly astonished to learn for a fact that a very large percentage of all the forest trees planted on the Northwestern prairies are pratically dead before they are planted. This is especially true of all the evergreens or conifers, and the trouble is aggravated in this, that the inexperienced planter can't always tell a dead tree from a live one, and keeps right on planting stuff only fit for a brush heap. It would seem as if any one could tell a dead Cottonwood seedling from a live one ; and as more Cottonwoods are being planted than any other variety, I think it best to say that millions of them are gathered every fall before the terminal bud has formed—are packed with all their green foliage in full vigor in tight boxes for shipment, and commence heating at once, and on arrival at their destination are "too dead to skin"—they are planted, and the victims are naturally discouraged, and lose their interest in tree planting, because they don't grow. Millions of young trees and cuttings, shipped by careful, conscientious men, who know their business, are unaccountably delayed in transit, arriving at their destination in a damaged condition. Railroad managers and freight agents ought to make a memorandum of this, as the losses occasioned thereby are particularly aggravating, and arouse the most bitter feeling against the railroads. The damage, too, and total loss of the trees themselves, are wholly insignificant in comparison to the losses involved in their delay; for a man can plant damaged trees on his tree claim if he can get them in time, but if they are delayed too long on the railroads, his claim, worth anywhere from $50 to $1,500, is in jeopardy for the want of $30 or $40 worth of trees which he has bought and paid for, railroad freight included, and he must resort to the most degrading and contemptible artifices to hold his claim. As a railroad employe and as an independent citizen, and acting in both capacities, it is my duty to call the attention of the proper authorities to the necessity of reform in this behalf. Plant deep, and press the loose earth so firmly about the roots as to prevent any cavities, and any circulation of air among the roots. The process also assists in retaining the moisture, and thus lessens the danger from drought. Unless the weather is unusually wet, it is good practice to make a puddle of mud and water of the consistency of gem-cake batter, into which the roots of the young tree should be thrust. At all times during the planting season keep on your guard against the withering effects of sun and wind on the roots. Do not permit the least exposure in this direction that can possibly be avoided; and, when it comes to evergreens, bear in mind that, owing to the resinous nature of the sap, what an inexperienced man would consider but a very slight exposure is usually fatal. From my own experience in fishing, I am satisfied that a brook trout will live out of water about as long as an evergreen will live with its roots exposed to wind and sun.

What varieties to plant. A good general rule is to plant those varieties that are indigenous to your locality, or as near you as you can find them. In going from the big woods of Minnesota to the foot hills of the Rocky mountains, one variety after another drops out, until our choice is limited to the Cottonwood and Box Elder. These varieties keep up a straggling procession clear across the great interior treeless region—in fact, clear across the continent. I am informed on good authority that the Hackberry, Red Cedar, Cottonwood and Box Elder are the only varieties of forest trees that have held their own, and can occasionaly be found in nearly every portion of the arid region, all other varieties having played out. So far as Western Minnesota and Northern Dakota are concerned, I very confidently recommend Box Elder, Green Ash, White Willow, Cottonwood and Elm, as absolutely sure to grow if properly handled. I might also, with nearly the same certainty, recommend the Soft Maple, but for its unfortunate habit of killing down if its first winter out happens to be an open one; but for all that, I find there is a good deal of "come out" to them. With this list you can plant your ten-acre grove on your tree-claim with more certainty of satisfactory results than from the planting of any other crop I know of; and as these varieties grow up and shade the ground, you can gradually introduce more valuable and less hardy varieties, thinning out enough of the original occupants to make room for their new neighbors, leaving enough of the "old settlers" as "nurse trees" to protect the new comers. In some such manner as this, it is not unreasonable to suppose that nearly all the varieties of timber now found in the Big Woods of Minnesota will eventually be grown successfully all over the great treeless and arid region of the interior, and the Great American desert, which once figured so conspicuously on our maps, will ultimately become a tradition of the past.

Cultivation. The wonderful results obtained from a comprehensive and thorough cultivation of the human intellect are not more striking and strongly marked than are the results of good cultivation upon the earth and her products. Hence, I recommend the most thorough cultivation of the soil from which the young forest is to be evolved, until such time as the growth of the trees prevents further cultivation.

The proper time for cultivation is from the time grass starts until about the first of August. By doing this you enable the trees to withstand drouth. Six inches of finely pulverized earth is the best mulch you can get, and a good mulch retains moisture and retards evaporation. In this connection permit me to jump over the traces, in further illustration of the effects of cultivation of the soil of the open prairie region between the Big Woods and the foot hills of the Rocky mountains. In its uncultivated state, its normal condition seems one of aridity and sterility. The grass is generally short and scanty, except in the low grounds. The soil is hard, and beneath it is still harder and very compact; the whole surface of the country shedding the rainfall better than an average board shanty. In a dry time the surface, under the exposure of hot sun and scorching winds, becomes parched and cracked into innumerable fissures, sometimes and in some localities to an extent that it renders traveling on horseback a dangerous exercise. I have seen large tracts of our own Minnesota prairie in this condition, and of no more apparent value to the casual observer than so many acres of blue sky. Not a tree, bush or shrub within sight. Practically a desert. While the frost is coming out the soil becomes somewhat ameliorated, and occasional showers permit the process of breaking the sod. This is the first step in arresting the aridity. The sod soon rots. Then set the plow down as deep as you can navigate it, bringing up to the surface as much fresh dirt as possible. You have now got it where it feels the effect of rainfall. It don't shed rain like a duck's back any longer. Continue the preparation of the soil by repeated and deeper plowings. When you get somewhere in the neighborhood of ten or twelve inches of mellow ground, stick in the Cottonwood and Box Elder seedlings, also seeds of the Green Ash, and some Willow cuttings. Apply the cultivator. Soon the process of subsoiling commences. Surviving the silent forces of nature, the young seedlings and the seeds and cuttings commence the process of subsoiling by thrusting forth innumerable roots. Silently, slowly, surely, yet with irresistible power, they penetrate the soil. They are hunting for food and drink. They are commencing the struggle for existence. At this critical period the intelligent tree-planter steps in and assists nature by the cultivation of the surface soil. With this timely assistance the young plants redouble their exertions. The moisture is pumped to their extremities—their circulation is healthy, they grow both ways—their roots tearing away toward the bowels of the earth with a vigor and energy that put to shame the best efforts of the most ponderous locomotive engine. From one season to another the subsoiling process goes on; the roots grow larger, longer, and stronger, getting down below the influence of scorching winds and blazing sun. The bodies and branches shoot up toward the sun, after heat, light, and air. The overshadowing branches, the deepening soil, the falling leaves, complete the process, and the particular ten acres of God's footstool, under the auspices of the Congressional timber culture act, stand forth redeemed, regenerated—an "oasis" in the desert. The shadow of a "great rock in a weary land" is nowhere beside it. It compels an involuntary tribute of admiration from the most brutish soul. The beasts of the field and the fowls of the air seek shelter and find solid comfort within its hospitable area. The belated, confused, weary, storm-buffeted traveler hails it as a sure landmark from which to take accurate bearings, and in times of exceeding peril a certain refuge and sometimes salvation from death itself. In portions of Western Minnesota there was scarcely a drop of rainfall last season from before harvest until the beginning of winter, and not enough then to amount to any thing. The unbroken, uncultivated prairie seemed dried out, and, except in springy places, wholly destitute of moisture. Even the sloughs, which in ordinary times are reservoirs of water, were in some localities so thoroughly dried out that the ground was cracked and split in all directions. Yet in the midst of this seeming aridity the cultivated fields showed no signs of distress—the summer-fallowed soil was moist to within an inch of the surface, and in the young groves of four to six year's growth the soil was absolutely moist—nearly wet from the surface down. Three hundred miles further out west and north on the line of the Northern Pacific Railway the conditions were the same. They had more rainfall out there in October and November than in Western Minnesota, but all through August and September, the season of harvesting and threshing, there was scarcely rain enough to wet through a man's shirt sleeves, and the uncultivated ground was parched and dry. In backsetting the breaking, which had been done in June for railroad tree-planting, we brought up and turned over from five to eight inches of soil that seemed as dry as powder. Prairie fires were running in all directions; this all through the month of August—yet at no time during the season did our young trees grow more rapidly, or present a more healthy or vigorous appearance, than during this season of drouth. We had some days out there, then, when it taxed the physical endurance of men and teams to their utmost limits; and I can honestly record it as a fact that our young trees out in Hazen's desert, on and beyond the 100th meridian, that were planted the preceding May, grown out there from seeds, cuttings, and yearling seedlings, within 100 days from date of planting, had thrust their roots down into the earth to the depth of two to four feet, pumping their own water, growing like weeds, and laughing to scorn influences that theoretically ought to have destroyed them. In fact, their growth was so rapid I dared not use the cultivator among them enough to keep the weeds down, and even with this precaution their terminal buds delayed their appearance later than usual; but they ripened up in good shape, and have gone into winter quarters in good condition. Although not strictly called for, or in order, I desire to make mention of another fact, because the majority of mankind don't remember much of any thing more than a year, and this paper will be a part of the record in the progress of Forestry. The big freeze of May 20th, 1882, or thereabouts, extending all over the Northwest—giving them a dose of genuine winter all through Central Iowa—killing down their corn and giving it a back-set from which it never fully recovered—had similar disastrous effects on Forestry. Millions of young Ash and Box Elder plants, from seed planted the preceding fall, were then just fairly out of the ground, and were utterly destroyed. Our earliest planting of Box Elder and Cottonwood yearlings had commenced putting forth leaves. The buds of the White Willow cuttings were swollen full, and the White Willow hedges of one year's growth and upward were nearly in full foliage. This freeze had no apparent effect on any of the foregoing of one year's growth and over, except the Cottonwood. In our railroad work I estimate nearly or quite one-fourth of our yearly Cottonwoods of the earliest planting were killed, root and branch, by this unexpected freeze. In certain localities in Minnesota, in the central portions of the state, I observed young artificial forests where rows of Cottonwoods, ten to twelve feet high, were killed out root and branch by this same freeze; the rows of Ash, Elm, Box Elder, Willow, and other varieties in the same grove, escaping unharmed. I have always been a staunch friend of the Cottonwood, and am yet, and don't propose to go back on it. It is a good friend of ours; but for all that this weak spot in its character should be recorded.

Legislation. Some of you may deem this a digression. Not so. We are here on business, the vigorous prosecution of which promotes the Commonwealth. The machinery of state was constructed for the very end we have in view—the promotion, security, and protection of the Commonwealth. Let us call into requisition some portion of this machinery in the protection of our native forests, now being ruthlessly destroyed by fire; in the care and protection of the hundreds of thousands of acres which have been burned over, and are now struggling to again cover and reclothe the charred and denuded surface; in such legislation as will prevent the wholesale waste and unnecessary destruction of young and growing timber in our lumbering operations; in such legislation as will abolish and prevent the abuses now perpetrated with impunity under the timber culture act; and also such legislation as will scatter broadcast such practical information on the subject of Forestry among the people on our prairie districts as will enable them not only to accomplish the best results in that direction in the shortest possible time, and with the least expense of labor, time, and money, but also such literature as will wake them up, arouse their enthusiasm, and create a generous emulation and rivalry for the best results.

Mr. President, our broad, beautiful, fertile prairies, in our own state and for hundreds of miles beyond, are fast filling up with families from all parts of the globe, allured by the glowing publications of the state, the railroad companies, and the public press. The little board shanties, sod cabins, and "dug-outs" already spot tens of thousands of quarter sections far out in the illimitable western horizon. They are the pioneers of civilization—the advance guard of that overwhelming wave of emigration that even now is the astonishment of the world. The great mass are poorly equipped for the struggle that awaits them. Fuel and shelter are their primal necessities, without which thousands will be driven back, cursing the agencies which allured them hither. Those men are there not merely to eke out a miserable existence; they are depended on to raise food for the world, to furnish business for the railroads, and revenues for the state. Consequently the state and the railroads are mutually interested in keeping them contented. What better way than to teach and assist them in planting forests and wind-breaks for shelter and fuel, rendering them thereby fully as comfortable as they would be 300 miles further south? Is the state doing her duty in this behalf? Do her representatives take any interest in the matter at all commensurate with its importance? Do you, gentlemen, and does this State University take such interest in this cause as you might do without damaging your prospects for time or eternity?

These questions are pertinent; possibly impertinent. Here we are reveling among Pine slabs and sawdust up to our necks, while 100,000 of our frontier friends are, even at this moment, twisting slough hay and praying Almighty God to keep them from perishing. What are the railroads doing? Some of them are doing nobly; some are doing just nothing at all. But in the aggregate they are doing far more than the state for the encouragement of tree-planting. The men who represent these districts in the legislature are expected, by their constituents, to lead off in this direction. They have only to do it to secure such cordial support from the older and better settled portions of the state as to make it a success—a success that will crown them with glory far more imperishable than can be gained in senatorial contests. I am informed that in the publication of your transactions you are unwisely limited to a 300 page pamphlet. If this is so I have already taken up too much space. I have tried to be economical in the use of words—merely touching briefly on the most salient points—a mere skeleton, instead of a well rounded body of facts elaborately illustrated. You need a bigger legislative appropriation, so that a man can take room enough to do justice to his subject without trespassing on the territory the next man needs and is equally entitled to, and big enough to publish and circulate an edition large enough to go around. Such being the case, the other section of my paper, Ornamental Tree Planting, must be postponed.

EXPERIMENTAL PLANTATION OF THE EUCALYPTUS, NEAR ROME.

BY THE EDITOR OF THE AMERICAN JOURNAL OF FORESTRY.

MUCH has been said in recent years, concerning the benefits to be derived from the planting of the *Eucalyptus* in regions where the climate will allow of its growth, and one of the localities mentioned as promising greatest success, is a very sickly region around the Abbey of Tre-Fontane, in the neighborhood of Rome. The information given me by the Hon. George P. Marsh, while I was at Florence, in the autumn of 1881, made this subject still more interesting, and soon after my arrival at Rome I visited the place.

It is found about three miles south of the city, and not far from the left bank of the Tiber, in a somewhat low but not marshy region, now thinly inhabited but only a part of the year. The Monastery at this place consists of three churches, one of which covers the spot where, according to tradition, St. Paul was beheaded. The oldest dates from the ninth century, and the latest from 1599. From having been for some centuries a place of much importance, it was finally abandoned, and for a long period was uninhabited on account of the sickness, which appeared so regularly and so severely every summer, as to justify the name that came to be applied to it as "*The Tomb.*"

Mrs. Jameson in her book entitled "*Sacred and Legendary Art*" (p. 130), in speaking of this place says:

"In all the melancholy vicinity of Rome, there is not a more melancholy spot than the '*Tre-Fontane.*' A splendid Monastery, rich with the offerings of all Christendom once existed there; the ravages of that mysterious scourge of the Campagna, the malaria, have rendered it a desert; three ancient churches and some ruins still exist, and a few pale monks wander about the swampy dismal confines of the hollow in which they stand. In winter you approach them through a quagmire; in summer, you dare not breathe in their pestilential vicinity; and yet there is a sort of dead beauty about the place, something hallowed as well as sad, which seizes on the fancy. In the church properly called 'San Paulo delle Tre Fontane,' and which is so old that the date of the foundation is unknown, are three chapels with altars raised over as many wells or fountains; the altars are modern, and have each the head of St. Paul carved in relief. The water, which appeared to me exactly the same in all the three fountains, has a soft insipid taste, neither refreshing nor agreeable. The ancient frescoes have perished, and the modern ones are perishing. It is a melancholy spot."

With reference to the insalubrity of the Campagna of Rome, Mr. Robert Burn, in his work entitled "Rome and the Campagna" (p. 22), says: "It is not difficult to see why the peculiar geological formation of the Campagna proves, without careful drainage, extremely deleterious to health. We have there a district containing numerous closed valleys and depressions in the soil, without outlet for the waters which naturally accumulate. The tufa which composes the surface seems commonly to take the shape of isolated hills with irregular hollows between them so as to impede the formation of natural water courses. Under this tufa is a quantity of marl and stiff clay, which retains the water after it has filtered through the tufa, and sends it oozing out into the lower parts of the country, where it accumulates and, mixed with putrescent vegetable water, taints the surrounding atmosphere."

He notices that the ancient Romans did not feel the baneful effects of the malaria, and down to the Augustan age a numerous population inhabited the region where now human beings fear to encounter the deadly effects of the air for a single night. Among the causes that may have wrought a change of climate, he mentions that the heats of summer may have been tempered by a greater extent of woodland, but principally the neglect of drainage and of cultivation, so that we find now a festering marsh or a rank weedy tract, once occupied by busy farmers.

The soil in this region, as in most of the higher portions of the "Agro Romano," is of volcanic origin, and the arable portion is from ten to fifteen inches deep—a mixture of clay and sand, not very uniform as to quality, but on the whole fertile and rich enough for most kinds of cultivation. The sub-soil, however, consists of a kind of tufa, called in the language of the country "cappellaccio," so solid that the roots of the trees could no where penetrate. Under this hard layer, ranging in thickness from twenty inches to eight or ten feet, there was found a deposit of "pouzzolane," a reddish volcanic sand or granular tufa, of great depth, which when mixed with lime, forms a very hard and durable material known as "Roman cement." For thousands of years, enormous quantities have been taken out from under the region adjoining Rome, leaving the caverns known as "catacombs," the entrance to which is not far from the road to the Monastery. The country around is neither level nor marshy, but undulating, and rises into hills of moderate height. Although apparently dry, water is found at a small distance below the surface—the pouzzolane, having the property of holding it like a sponge. Ditches had been made, but they drained off the water from only a short distance on either side, leaving the ground, at two yards away, as full of water as before.

The opportunities for cultivation, aside from this insalubrity, were excellent, and were to a considerable extent improved; but toward the end of June, as soon as the harvest was over, the poor inhabitants might every year be seen by single families, or in companies, removing from all the more sickly regions outside the walls of Rome, and taking their course toward the healthier regions upon the Albanian hills, where, in villages above the reach of the pestilence of the plains, they might hope to escape with life.

They returned toward the end of October, when the sickly season was over, to prepare the land for another crop, but were obliged again to flee as soon as it was gathered—and so from year to year and for centuries, they and their fathers before them, had migrated back and forth, with the returning seasons, and without prospect of relief.

The reputation which the *Eucalyptus* had acquired from attempts at cultivation in France, led to hopes that it could here be advantageously employed in improving the sanitary conditions, and a brotherhood of French Trappist monks was found willing to risk their lives in the attempt. In February, 1868, they were placed in charge of the premises, and began a task which to the casual observer appeared at best but a forlorn hope.

At that time they had no experience, but they succeeded in getting a grove of *Eucalyptus globulus* started around the Monastery, and it is now in most thrifty condition, and nearly seventy feet high. It was not three acres in extent, but within five or six years, it began to cause a sensible improvement. About a dozen of the brotherhood died within this time—although they had taken the precaution of returning to the city every night to sleep.

It was not till 1874 that they ventured to sleep on the premises, and although some were taken sick, it was found that the disease took a mild form, and no malignant cases have since occurred. They turned their attention to the vine and fruits, and continued to experiment with the *Eucalyptus*, various species of which were tried with varying success.

The result justified experiments upon a much larger scale, and an agricultural company was formed under the name of "La Societa Agricole, Troppisti di San Paulo," with whom, on the 30th of September, 1879, a contract was executed by the authorities owning the property, amounting in its terms to a long lease, upon certain easy terms prescribed.

The company agrees to pay an annual rent, and to plant the 495 hectares (1,222 acres) with some crop, and at least 12,500 Eucalyptus trees a year, until the whole is under improvement. They are to have the services of convicts from the prisons, who are to be paid at the rate of a lira (about twenty cents) a day. In selecting the latter, those were to be taken who had been sentenced for at least ten years, and who had already served out more than half their time. They could receive but a very small part of their wages until discharged.

At the time of my visit, there were about 150 of these men at work. They were guarded by a few veteran soldiers, two of whom were always upon horseback while the prisoners were out, and but two escapes have up to the present time occurred. We learn from a report made in February, 1882, that there were 237 of these men thus occupied, and that they were working with a fidelity not surpassed by an equal number of free laborers. The discipline is strict, but less so than inside the prison walls, and the monks themselves, who are always with them, and assisting in their labors, have been able to exercise a favorable moral influence among them. In fact, there were some who appeared to be striving to earn a reputation for fidelity and good conduct, that should lead to their continuance in the service after their time of sentence had expired. In speaking of the effect observed upon these prisoners from the nature of the work, and the treatment received, a recent writer says:

"When a convict finds himself well treated, and well paid, he prefers to finish his time, rather than to run the risks of of an escape. This motive has been considered by the penal authorities, and the result has justified the expectation.

A guard fell, accidentally wounded, while conducting a squad of prisoners, and his weapon dropped from his hands. Nothing would have been easier than for them to have dispatched him, or, at least, to have left him and fled. But they thought of nothing of the kind; they took him carefully up, and brought both their guard and his arms to the Monastery. Is it not a proof of amendment where, under such circumstances, these men preferred to finish their time, rather than to loose their earnings, that would be due to them on going out?" *

But my principal object is to consider the question of Forest-culture and not prison-discipline. It had for its ends to determine three principal points:

1st. Can the Eucalyptus be cultivated successfully,—and if so what species will thrive best, and what is the best mode of management?

2d. Do these trees purify the atmosphere and conteract disease, and if so to what extent?

3d. If both the above inquiries are satisfactorily settled, how can the example be turned to greatest profit, by inducing proprietors elsewhere to do likewise?

In reference to the first two questions, there can no longer be any doubt. Although the temperature in winter has gone down to eight or ten degrees (Fahrenheit) below the freezing point, and there have been seasons of protracted drouths, and violent winds, the trees have not been killed; but from differences in their rate of growth, some appear to be preferable to others.

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* E. Meaume, in the *Revue des Eaux et Forêts*, 1882.

During the year ending October 1, 1881, about 32 hectares (79 acres) were planted with 25,800 trees, of which about 1,200 were to replace those dead or broken down of previous years. Of these, 5,200 were the "*globulus;*" 12,700 the "*Red-gum;*" 2,300, the "*resinifera;*" 800, the "*melliodora;*" 550, the "*polyanthemas;*" 850, the "*rostrata;*" and 3,400, various other species.*

The experience of former years had led to the preference of these species, as best adapted to resist the cold, and as suited to the soil. It was found that in places where the soil was rather damp, the *Eucalyptus viminalis, E. urnigera, E. rostrata*, and *E. tereticornis*, prospered best; but that where it was dryer, the *E. resinifera, E. melliodora* and *E. sideroxylon*, grew to better advantage.

As for the *E. globulus*, it appeared to be easily accommodated almost anywhere, without showing particular preferences, wherever it was tried.

The time preferred for planting was spring, and begun as soon as the danger from frost was over. In fact it extended in 1881, from the 15th of April to the 15th of September, and some planting was done as late as October. The plants set in April and May, when they were about six inches high, had grown to four feet, but those set later suffered some from the locusts, and from a fire, and did not make relatively so large a growth. The trees were set in pits about three feet square, and in order to get a chance for rooting in the hard tufa that overlays the pouzzolani, it was found necessary to blast it up with dynamite. The holes were at first drilled by hand, requiring from twenty to twenty-five minutes, but a portable revolving drill had been contrived, that would make a hole in five or six minutes to the depth desired, which varied from thirty inches to four feet. This crust being once broken through, there was nothing to hinder the trees from sending down their roots to any desirable depth.

The seeds are sown in boxes filled with a mixture of garden soil, with a little well-rotted manure, the whole being well mixed and sifted in. They then mark off the surface in parallel lines some three inches apart, along which the seeds are scattered, and they are then covered *very slightly*, by sifting on more of the same soil. The soil is then moistened, and somewhat shaded until the seeds sprout. They must be carefully watered, weeded and watched, until they are some eight months old, before they are finally set where the trees are to grow. When fairly up, and an inch or so high, the little trees are carefully taken up and set out separately, giving each one a separate space in a flower-pot or a box. A kind of handbarrow borne by two men, will hold about forty of the young plants, with the boxes or pots that contain them, and they are carefully transferred to the soil, in the places first prepared, which are in rows about six feet apart, without any disturbance of the roots, or the earth around them.

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* Among the other species not above enumerated, are the *E. urnigera, E. teriticornis, E. coccifera, E. viminalis, E. Tasmania, E. Gunii, E. Stuartiana*, etc.

The germs were quite variable, and it requires much skill to recognize, in the boxes, the varieties that appear. The young leaves present curious anomalies, and often differences on the same stem, not only in their size, but in their color and form. While some are almost round, and of a deep green, others may be long, and of a lighter shade. It is only after some years of growth, that the leaf takes its definite form.

When set in the ground, the soil is pressed down in a bowl-shaped depression around them, so that it will hold the water which is freely applied,—eight or ten quarts to each tree. This water is brought in casks, upon carts, and is derived from a small stream a tributary of the Tiber, and from shallow pits. The surface is leveled up the next spring, and the trees will not need to be again watered.

The "*globulus*" and "*resinifera*," grew equally well and resisted about the same amount of cold, but the latter bears seed when four years old, and they are easily gathered from the young trees. The former does not seed till fifteen years old, and then it is sixty feet or more in height. It is no easy matter to seize the right moment for gathering its seeds, for the capsules let out their contents as soon as they are ripe.

For this reason, the seeds of the "*globulus*" must be high-priced, as compared with those of the "*resinifera*," which are already so plenty, that the monks are able to sell from their own raising, beyond what they need for their own use.

In an article of M. Vallée, a French agriculturist who has given particular attention to this subject, several measurements of growth are given, which reduced to English measures are as follows:

The average of 20 trees of the *Eucalyptus globulus* planted in 1875, and measured in April, 1879, at 5 feet from the ground, had a girth of 10.6 inches, and the heights of a dozen measured were, on an average, about 30 feet (8 meters).

Another lot, of half a dozen planted in 1872, were in April, 1879, 29.5 inches in girth, and about 44 feet high.

One planted in 1871, was then 30.7 inches in girth and 49⅕ feet high; one planted in 1870, was 35½ inches around and 50½ feet high. At the end of 1881, trees planted in 1870–1–2, had grown to 45 inches in girth. All of them when set were from 6 to 9 inches high, and were started in pots or boxes.

In one tree cut down to the ground a sprout had grown in ten months to a height of 10 meters (33 feet) and was 24 inches in girth at two feet from the ground.

M. Vallée well remarks: "Where can we find in our forests, a tree presenting so marvelous a growth? What other tree, in eight years, can show a girth of 3 feet, and a height of 52½ feet?"

In speaking of the amount of evaporation from the leaves, the same writer says, that the *E. globulus* has been found to give off from a square of leaf-surface, in 12 hours of day-light, at least 2.4 kilogram. (5¼ pounds meters)—the conditions at the time of observation not being most favorable on account of the moderate intensity of the light.

In the free air, and with a considerable wind, the amount evaporated is more.

It is the intention to leave belts of land between the rows of Eucalyptus trees for the cultivation of grape vines, and to some extent of wheat and other grain. It is thought that about 350 trees to the acre will satisfy the requirement as to salubrity, and as this tree presents the edges of its upper leaves to the sky, it shades the ground much less than any other kind.

But as some of the soil is not proper for the vine, it is intended to undertake experiments upon the higher grounds in order to ascertain how closely the trees can be set, to secure the greatest profit as a forest-growth, and with a view of thinning and clearing at fixed intervals, according to the rules of Forestry.

The experience at Tre Fontane has not sustained the reputation that the *Eucalyptus globulus* has elsewhere acquired of being selfish, and allowing nothing else to grow near it.

The trees near the Monastery that were planted first, and that have been trimmed up high, do not prevent plants of various other kinds from growing perfectly well under their very thin shade.

When carried through the first year, the trees will need to be hoed and weeded for a year or two afterward, and it is found profitable to keep the ground mellow by spading around the roots for several years longer. The critical period is of course the first year, or rather the first winter, which is more apt to find the tender plants not sufficiently hardened to resist the cold. If they are carried safely through and get well rooted, they will be in condition to take care of themselves. It is even found that the fields where they are planted may be pastured with sheep, while the lower branches almost reach the ground, for the leaves are so bitter, that after browsing off a few for the first time, the sheep will let them alone. With cattle the case is different, for although they will not eat the leaves, they would be very apt to break down the young trees by rubbing against them.

In comparing the volume gained by different species, it is thought that while the *E. globulus* gains in height, it looses in thickness, as compared with the *E. resinifera;* but these and many other points are under careful study, and the results will be made known by the government, when definitely ascertained.

In regard to the sanitary effect, this seems now to be settled beyond a doubt; and it appears to act partly by the effect of drainage which the trees secure, in the evaporation from their leaves, and partly by the aromatic emanations that they perceptibly diffuse in the atmosphere.

I have already noticed that the soil contained water throughout this region, at no great depth, and that from its retentive qualities, it could not be drawn off by ditches.

An examination made in 1872, over an area of 400 square metres of low ground, showed that the water could be found any where at a depth of six inches. It can not now be reached until we descend to a depth of six feet. The Eucalyptus therefore acts as a suction-pump drawing water from the soil, and giving it off as vapor from the leaves. The amount of water evaporated from these trees every day, has been calculated at four or five times the weight of the leaves.

It may not yet be fully known, as to how far the chemical changes that take place in the leaves, may effect the salubrity of the atmosphere around them—or whether a single belt of forest-verdure has the power of intercepting or of absorbing the pernicious qualities which we call *malaria*, and of which we know the most by the effects. We have, however, these two facts before us:—There are some two hundred and fifty acres around the Monastry of Tre Fontane, that have been planted with about 90,000 Eucalyptus trees, some of them it is true still small, but others seventy feet or more in height,—and that this region, once so infested with fevers that it could not be inhabited, now supports a considerable permanent population, among whom fevers are but occasionally experienced in certain seasons, and in a very mild form. In 1881, for the first time, the convicts employed, were lodged upon the premises, instead of being marched back to the city every night, and but slight inconvenience from sickness has been noticed among them.

I have already mentioned the liability of most species of Eucalyptus to be injured by the frost. In northern Italy the *E. amygdalina*, or "Tasmanian Peppermint tree," sometimes called the "Giant Eucalyptus," or "Mountain Ash," was the only one that survived the exceptionally cold winter of 1879–80. It has been tried to a slight extent at Tre Fontane, but its growth is very slow, perhaps because the soil in that particular place is not suited to its requirements. In other regions its febrifuge qualities have been as distinctly marked as in the other species, while its hardiness commends it at least to further experiment. A ten-year-old tree of this species, in a garden upon Lake Maggiore, is known to measure 1.6 metres in girth, and to be more than twenty metres high." *

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* Report of Senator Torelle to the Italian Senate. The above measures are equal to 63 inches in girth, and about 66 feet in height.

Certainly there is nothing discouraging in this result, and there is everything to hope, if localities can be found where it will gain on the general average at even half these rates.

But this Experimental Station of Tre Fontane in itself so full of interest, from results secured within its own precincts, becomes one of commanding importance, when considered in view of its possible bearings upon the future. There are other regions in Italy where the soil is as fertile and the air as pestilential as the region outside the gates of St. Paul, near Rome.

The coast-region from Leghorn to Civita-Vecchia, through which I passed by railway, bears evidence of great agricultural resources, and some cultivation; but it is uninhabited, excepting as the peak of every hill has its village, or as the servants of the company have their cottages at the stations along the way. The traveler may not notice anything unusual in the health of these men—but the company is obliged to employ twice at least the number that their service would otherwise require, for sometimes half or two-thirds of the number, in summer, are down with fever. The Maremma of Tuscany was indeed once a region densely populated, as well as highly fertile, and the government has in past years, by costly works of drainage and otherwise, done much to improve its sanitary condition; but it is still sickly in summer, and perhaps justifies the old Italian saying, that "in the Maremma one can make his fortune in a year, if he does not die in six months."

Now, if Eucalyptus plantations can render Tre Fontane healthy, why not the whole of this coast region? Why not the Adriatic coast from Rimini to Otranto, which is almost as unhealthy? In short, why not everywhere in Italy or in other countries, wherever like conditions produce like effects, and within the limits where these species can be cultivated.

From this point of view the experiments now in progress at Tre Fontane, rise from the level of a mere financial investment by a company, for its own advantage, to the dignity of a philanthropic enterprise for the benefit of mankind, and their third declared object, that of presenting a model that shall deserve general imitation, wherever there is the opportunity and the need, will be as fully successful, as their first and second objects have been proved to be, in what has been already accomplished.

THE ARBOREAL FLORA OF ARKANSAS.

By Prof. F. L. HARVEY, of Fayetteville, Ark.

LIMITED space will prevent a discussion of many interesting phases of the subject, and those considered can not be given in detail.

We will make such introductory statements as are necessary to render the subject intelligible; enumerate the forest trees of the state; give their distribution, adding such general information regarding the species as may seems interesting; give a summary of the orders, genera, and species, and, in conclusion, mention the peculiarities of the arboreal flora of Arkansas.

The facts contained in this paper were gathered, principally, while making several visits into various portions of the state, and by a local study of the flora of Northwest Arkansas for eight years. A few species, *not observed*, have been added by the authority of such competent observers as Prof. Leo Lesquereux, Mr. G. W. Letterman and Nuttall.

The geological formations of the state are divided into Archean, Silurian, Subcarboniferous, Millstone Grit, Cretaceous, Tertiary and Quaternary areas: thus affording the means of studying the interesting question of the effects of geological horizon upon tree covering.

The State may be divided into the upland and low country. The former corresponds nearly with the Paleozoic, and the latter with the Neozoic formations. Draw a line, beginning a few milest west of longitude 31°, at the north boundary of the state, in a southwestern direction to Little Rock; thence to the north boundary of Clark county, a few miles north of the Iron Mountain Railroad, and from there nearly due west to the line of the Indian Territory. That portion of the state north of this line is the upland, and the remainder of the state lowland.

The forest trees, in a general way, may be divided into those peculiar to the upland, those found only in the low country, and those common to both.

The upland corresponds quite well with the *Paleozoic*, and the lowland with the *Neozoic;* yet the variations in species, in a general way observable, can not be due to a change in geological horizon, but rather to a difference in elevation and latitude, and the resulting changes in moisture and temperature; together with variations in the kind, fertility, and friability of soil. It is true that some species show a preference for limestone, others prefer sandstone, while some grow better in clay; but these kinds of soils are common to all geological horizons. On account of variations in soil and other conditions, the species differ about as much on the same geological formation as they do on different horizons. Unless the chemical ingredients and physical conditions of the soil, and atmospheric influences, are *quite different*, the luxuriance rather than the specific character of the vegetation is affected.

There is a marked difference between the physical conditions of the Paleozoic and Neozoic areas in Arkansas. The soil of the former is rocky, shallow, sterile, elevated, and mostly northern in location; in contrast with the deep, rich, friable soil, and southern location, of the latter. We would expect what we find, that each region has peculiar species. The growth, in the river bottoms of the upland, differs in specific character, and also in luxuriance, from that of the ridges. The species, that properly belong to the low country, by favorable conditions offered in the river bottoms, extend far into the Paleozoic region.

Quercus phellos and *aquatica*, though properly species of the low country, are found in the Arkansas river bottom to the border of the Indian country.

Quercus stellata of the uplands, is small and scrubby in the ridges; but in the river bottoms of the same region it is a fine tree, from three to five feet in diameter.

Pinus mitis reaches its best development on the divides in the low country, while in the uplands it is confined to the dry ridges.

Pinus tæda is strictly a species of the low country.

Quercus nigra is confined principally to the ridges of the uplands.

Latitude, on the same geological horizon, affects the specific character of the vegetation. The Butternut and Tulip Tree are probably not found in Arkansas far south of Helena, in Phillips county.

Carya myrisicæformis and *Pinus tæda* are on the Quaternary, but are confined to South Arkansas.

Fagus is found sparingly over the Quaternary formations from northeast to southwest part of the state.

From what is known of the tree covering of Arkansas, there is evidence to believe that physical conditions, rather than geological horizon, affect the specific character of the vegetation. We will leave this interesting question, however, for others to decide, after the trees and their distribution have been considered more in detail.

The entire state was originally covered with forests, excepting about 900 square miles of prairie land, widely distributed, but located mostly in Prairie and Arkansas counties. Excluding these treeless lands (900 square miles), and those cleared by cultivation and pastures (5,618 square miles), making, in all, only about one-eighth of the entire area, there is left over 45,000 square miles of timber land, abounding in forest trees of the first economic importanee and representing vast undeveloped wealth. Considerable timber has already been floated down the streams and exported; and railroads are being rapidly built through the extensive forest belts of the State.

In the following consideration of the forest trees of Arkansas, when no authority is given for statements, it may be understood that the writer has made careful determinations from specimens found growing spontaneously in the state. Naturalized species are included, also some species grown extensively for ornament.

Crowly's Ridge, which will be referred to in the distribution of the forest trees, is a low elevation of land of Quaternary age, dividing the waters of the White and St. Francis, and extending from the north boundary of the state, in Clay county, through Greene, Craighead, Poinsett, Cross, St. Francis, and Lee counties, to Helena, in Phillips county.

The common names given to the species are those used by the citizens of Arkansas, so far as we have been able to determine them.

In enumerating the species, the order given in Sargent's *Forest Trees of North America* has, in the main, been followed. The scientific names of the species are, in every instance, the same as those given in the book mentioned above.

The common names of the orders have been omitted, as, in most cases, the name is suggested by the common names of the species.

FOREST TREES OF ARKANSAS.

MAGNOLIACEAE

Are represented by

Magnolia acuminata, L.—(Cucumber Tree.)

In Newton county, in the upland; in ravines along the foot-hills of the Paleozoic, north of the Arkansas River, as far as the west boundary of the State. It is sparingly but widely distributed, reaching its perfection on Crowly's Ridge, attaining a diameter of four feet. We do not know of its occurrence south of the Arkansas River. Not plentiful enough in the State to be of much use.

Magnolia glauca, L.—(Bay Tree, Sweet Bay.)

Swamps of South Arkansas (Lesq.), also bottoms of Little River, north part of Hempstead county. Fruit and bark medicinal, used for rheumatism and intermittent fevers. Wood compact, suitable for inlaid work and joiners' tools.

Magnolia umbrella, Lam.—(Umbrella Tree.)

Garland county, near Hot Springs, and Montgomery county, where it is common along creeks and the borders of swamps, attaining a diameter of ten inches. It will probably be found elsewhere in the State.

Magnolia grandiflora, L.—(Magnolia.)

Not native so far as known; but extensively grown throughout the State for its beautiful flowers and glossy evergreen foliage.

In Southwest Arkansas it attains a diameter of two feet. Further researches may prove it indigenous.

Liriodendron tulipifera, L.—(Poplar, or Tulip Tree.)

The whole length of Crowly's Ridge. Not found elsewhere in the State. Common. Attaining a diameter of four to five feet. Lumber valuable. Cultivated for ornament and shade.

ANONACEAE.

Asimina triloba, Dunal.—(Papaw.)

Throughout the State in rich soil. In favorable situations grows fifteen inches in diameter. The fruit is eaten by man, but rejected by swine.

Large trees are split for rails. The bark, after maceration, is used by the country people to make ropes and mats.

TILIACEAE.

Tilia americana, L.—(White Wood, Bass Wood, Linden.)

Rich valleys of the upland, from the north boundary as far south as Garland county. Grows to be three feet in diameter. The lumber is used for lath, wagon boxes and in-door work. Mats are made from the bark. *Tilia alba* (Michx.) has not been observed in the State.

RUTACEAE.

Zanthoxylum clava-hercules, L.—(Prickly Ash.)

This species is not distinguished by the people from *Aralia spinoza*, and both are called "*Wait-a-bit*," and also "*Tear-Blanket*," on account of the spines they bear.

Throughout the low counfry, in rich soil; attaining a diameter of eight to ten inches. A curious tree, with warts on the bark, which are terminated by spines. Grown at Little Rock in yards (found spontaneous near by on the Arkansas River.—Warder).

Bark and berries aromatic, bitter, and exciting the flow of saliva. Used for toothache, also as a sudorific medicine.

SIMARUBACEAE.

Ailanthus glandulosus, Desf.—(Tree of Heaven.)

Introduced from China, but spontaneous in Arkansas along streams. Hard to eradicate on account of its tendency to run. Often a nuisance in yards. Foliage fine, but the staminate flowers have a disgusting odor, as have also the leaves and bark when crushed. We are glad to know the tree has a reputation in arid regions for holding embankments. Taking all things into consideration it has but little to recommend it as a tree for lawns and yards.

ILEXINEAE.

Ilex opaca, Ait.—(Holly.)

Common in South Arkansas. Extends along the low country in the east part of the State to Southeast Missouri. Probably not spontaneous in the upland. Wood used for inlaid work. Tree grown for the ornamental glossy foliage.

Ilex decidua, Walt.

Should be included among the trees, as it attains a diameter of eight inches in South Arkansas, and has a well-defined trunk.

RHAMNACEAE.

Cordalia obovata, Hook.—(Blue Wood.)

Common in East Texas, and, though not noticed in Arkansas, without doubt will be found along the western border.

Rhamnus Caroliniana, Walt.—(Pole Cat Wood, Brittle Wood.)

On the Neozoic, from the northeast to the southwest part of the State.

Prefers the ridges. Mr. T. B. Kitchens furnished Mr. Sharples specimens large enough for experiments from Craighead county. We found it on the Metamorphic formations of Magnet Cave, in Garland county, where specimens were seen eight inches in diameter. The wood is very brittle, and the plant has an unpleasant odor, hence the common names.

CELASTRACEAE.

Euonymus atropurpureus, Jacq.—(Wahoo, Burning Bush.)

Should be included in the list of trees, as specimens were found in the vicinity of Little Rock thirty-five feet high, and with a well-defined trunk six to seven inches in diameter.

SAPINDACEAE.

Aesculus flava, Ait.—(Sweet Buckeye.)

Said by Nuttall to grow in Arkansas. Has been reported from the Indian country. Though it has eluded our search, we suppose it grows in the State.

Aesculus glabra, Willd.—(Ohio Buckeye.)

Occurs plentifully in the rich bottoms of the upland in Washington, Madison and Sebastian counties. Extends as far southwest as the north tributaries of the Red River, where specimens were seen fifteen inches in diameter The roots and fruit of this species are used by Indians and whites to stupify fish. They are crushed and thrown into the water, or put into a sack and dragged through it. In an hour or two the fish rise to the surface apparently dead. The victims are collected by wading or gathered from a boat. This method is resorted to when the water is low and does not run over the riffles. All the fish in the hole, large and small, are sacrificed by this barbarous practice. The leaves and fruit of this species are poisonous to stock, and it is not uncommon for cattle to die after eating them.

Sapindus marginatus, Willd.—(Soap Berry.)

Reported from the State by Nuttall. Found by Mr. G. W. Letterman in Nevada county, where fine specimens one foot in diameter were collected.

Acer dasycarpum, Ehrhart.—(Soft Maple, White Maple, River Maple.)

Common in the river bottoms of Northwest Arkansas, where specimens four to five feet in diameter occur. It seems to run out as you go toward the southwest, where it is replaced by *A. rubrum*, L. Small specimens were seen on the Saline River, but none further southwest. Lumber much used for in-door work. Tree ornamental.

Acer rubrum, L.—(Red Maple.)

Is not distinguished from the preceding by the country people. Both are called by the same common names.

There is a variety of this species in South Arkansas, which is smaller, has smaller leaves and a dark bark. This species occurs throughout the State, but reaches its greatest development, in size and number of individuals, in the river bottoms of South Arkansas.

It is found sparingly high up the hills in the northwest part of the State.

Acer sacharinum, Wang.—(Sugar Tree.)

In rich valleys of the mountains it becomes the source of considerable sugar. Occurs sparingly as far southwest as the north tributaries of the Red River.

Var. nigrum occurs in Arkansas, but is probably only a lowland form of the above species.

Negundo aceroides, Moench.—(Box Elder.)

Sparingly distributed throughout the State in alluvial soil. Sometimes two feet or more in diameter.

Used for making sap troughs and ox-yokes. The lumber is sometimes used for in-door work. The tree is quite a favorite for shade; but is overrated, being short lived, and subject to the depredations of insects.

ANACARDIACEAE.

Rhus typhina, L.—(Staghorn Sumac.)

Is said, by Mr. Lesquereux, to grow in Arkansas, but we have not seen it. Mr. L. writes me that perhaps he mistook large specimens of *R. copallina* for it, as the leaves had fallen when he traveled in Arkansas. It was not then known that *R. copallina* is the larger species. It may, however, occur in the State.

Rhus copallina, L.—(Black Sumac.)

Attains the dimensions of a tree in Arkansas. Specimens six inches in diameter occur in the northwest part of the State. Larger specimens were observed in central locations, while in South Arkansas it grows to be a tree over one foot in diameter.

Rhus cotinoides, Buckley.—(Smoke Tree.)

Occurs in Tennessee, and was found by Nuttall at Eagles Nest, in the present boundary of the Indian Territory. It will, no doubt, be found in North Arkansas between these points.

LEGUMINOSAE.

Robinia pseudacacia, L.—(Black Locust.)

Extends from North Arkansas to the Red River. Prefers rich hill sides with a north exposure.

Wood durable. Used for posts and wagon hubs. There are posts in Northwest Arkansas, made from the wood of this species, that have been set fifty years, and are yet quite sound. Over-rated as a shade tree. Ugly in old age. A nuisance on account of the habit of sending up sprouts. The only redeeming features are the fragrant blossoms and compound leaves. For *economic* purposes it has few superiors.

Sophora offinis, Torr. and Gray.

According to Lindheimer, occurs on the prairies of the Red River in West Arkansas.

Gymnocladus canadensis, Lam.—(Coffee Bean Tree.)

Sparingly distributed throughout the State; common in the eastern portions on the Quaternary. Scarce in the mountains. Cultivated in Little Rock for ornament.

Gleditschia monosperma, Nutt.—(Water Locust.)

Saw specimens near Little Rock, in Cypress swamps. Said by Mr. Letterman to grow from northeast to southwest part of the State in the low country. A small tree of no economic value, though the foliage is handsome.

Gleditschia triacanthos, L.—(Honey Locust.)

Throughout the State in low ground. Much more common in South than in North Arkansas. Much more ornamental than the Black Locust.

Cercis canadensis, L.—(Judas Tree, Red Bud.)

Common along creeks and rich hill sides throughout the high country. Was found as far southwest as Texarkana. Have not seen specimens more than eight or ten inches in diameter. Wood compact. Flowers and foliage handsome. Desirable to cultivate.

ROSACEAE.

Prunus americana, Marshall.—(Wild Plum.)

Distributed throughout the State in alluvial soil, sometimes attaining a diameter of one foot. Fruit, variable in size, color and quality.

Prunus caroliniana, Aiton.—(Mock Orange.)

Occurs across the south part of the State in low ground. A small tree, but sometimes cultivated for ornament.

Prunus chicasa, Michx.—(Hog Plum, Chickasaw Plum.)

Occurs throughout the upland. Found in the country by the earliest settlers. If not spontaneous, the aborigines must have introduced it.

Fruit small, but quite well flavored when ripe. Greedily eaten by swine.

Prunus pennsylvanica, L.—(Bird Cherry, Wild Red Cherry.)

Will probably be found along the north boundary, though not yet seen in the State.

Pyrus serotina, Ehrhart.—(Wild Cherry or Cherry.)

Common in the uplands. Extends as far southwest as explorations have been made. Attains a diameter of several feet in Northwest Arkansas, where it is cultivated for economic purposes. Wood used for cabinet-work. Fruit small and scarcely edible. Handsome ornamental tree.

Pinus corinaria, L.—(Wild Crab-Apple.)

Common in the mountainous portion of the State, on the borders of prairies, or upon hillsides. Extends as far Southwest as Hempstead county. The tree is handsome in flower. The fruit is larger than that of the Siberian Crab-Apple, but sour and bitter. In Iowa, when good apples are not to be had, the fruit of this species is largely used for preserves and apple-butter. The fruit is boiled with saleratus, which removes the acidity and bitterness. The fruit never gets soft, as is the case with the cultivated apple.

Pyrus arbutifolia, L.—(Choke-berry.)

Attains the dimension of a tree in South Arkansas.

Crataegus aestivolis, Torr. and Gray.—(May Haw, Apple Haw.)

Known to occur by observation only in the Southwest part of the State, but probably more widely distributed. 20-30 feet high. Fruit large and edible. Used to make sauce, jellies, tarts, etc.

Crataegus coccinea, L.—(Scarlet-Fruited Thorn.)

Found sparingly in Northwest Arkansas and as far south as the center of the State, and perhaps further.

Fruit bright red; eatable. Tree a few inches in diameter; height about 30 feet.

Crataegus crus-galli, L.—(Cockspur Thorn.)

Found when explorations have been made. Probably occurs throughout the State. Very plentiful in the prairies of Northwest Arkansas. There are several varieties.

Crataegus flava, Aiton. Var. *pubescens.*

Found in South Arkansas in low ground.

Crataegus spathulata, Michx.—(Coral-berry.)

Common in the low country. Occurs on the Palaeozoic in low ground. A beautiful tree when in fruit.

Attains a diameter of 20 inches in South Arkansas. Would be desirable in cultivation.

Crataegus subvillora, Schrad.

Occurs in central Arkansas, and in the Eastern part of the State, according to Mr. Letterman.

Crataegus apifolia, Michx.

Common in South Arkansas on the Neozoic formations. A fine species with small fruit and beautiful foliage. Merits cultivation.

Crataegus tomentora, L.—(Pear Thorn.)

Occurs sparingly in North Arkansas.

Amelanchier canadensis, Torr. and Gray.—(Service-berry, May Cherry.)

Quite plentiful in the mountains of Arkansas—growing usually upon the edges of cliffs, both sand and lime, but sometimes on rich hill sides. The form found in Arkansas is var. *oblongifolia.*

HAMAMELACEAE.

Liquidambar styraciflua, L.—(Sweet Gum.)

Exceedingly common throughout the low country, where it is of the most abundant growth on alluvial soil. Found sparingly through the elevated portion of the State. Attains a diameter of 6 feet in South Arkansas. The wood of this species takes a fine polish, and when more desirable timber becomes scarce it will claim attention. The foliage surpasses in beauty that of the *Sugar Tree.* The fruit is also ornamental. The wings on the trunk and branches of young trees are curious. The young shoots are cut for canes.

Hamamelis virginica, L.—(Witch Hazel.)

Attains a diameter of 6 inches in South Arkansas, and probably merits a place upon the tree side of that obscure boundary between trees and shrubs.

ARALIACEAE.

Aralia spinosa, L.—(Tear Blanket, Wait-a-bit.)

Plentiful in the low country and in the river bottoms of the upland. Attains a diameter of 8 to 10 inches. The compound leaves and conspicuous inflorescence make it a beautiful and striking plant.

CORNACEAE.

Cornus florida, L.—(Flowering Dogwood.)

Common along cliffs, ravines, and hill sides throughout the State, also on the ridges in the low country. The flower involucre conspicuous. Flowering before the forest-trees are in leaf, it is quite attractive. The wood is hard and close grained. The bark bitter—used as a tonic and to break intermittent fevers.

Nyssa capitala, Wall.—(Ogeechee Lime.)

Said by Nuttall to occur in the swamps of South Arkansas. Has not been rediscovered.

Nyssa multiflora, Wong.—(Black Gum.)

Common throughout Arkansas, in both low and high ground. We are inclined to think that *N. sylvatica* is only a low ground form of this species. Wood tough and hard to split. Used for wagon hubs. The glossy foliage and graceful branches combine to make it ornamental. Attains a diameter of several feet in Arkansas.

Nyssa uniflora, Walter.—(Large Tupelo.)

Found as far North as Little Rock, growing in swamps throughout the south part of the State. The foliage large. A beautiful species in flower and fruit. Used to make wooden ware, and the wood of the roots for cork.

CAPRIFOLIACEAE.

Viburnum primifolium, L.—(Black Haw.)

Throughout the State on rich banks, cliffs and along streams. Specimens were seen in Drew county on Bayou Bartholomew.

Viburnum lentago, L.—(Sheep-berry.)

Occurs in Northwest Arkansas in low ground. Not so plentiful as the other species.

ERICACEAE.

Oxydendrum arboreum, D. C.—(Sorrel Wood, Sourwood.)

Found by Mr. Lesquereux in the mountains of Arkansas.

Kalmia latifolia, L.—(Laurel, Spoonwood, Calico Bush.)

Found in North Arkansas by Mr. Lesquereux.

Vaccineum arboreum, Michx.—(Farkle-berry.)

Reaches a diameter of 6 inches in South Arkansas, and is decidedly tree-like.

Rhododendron maximum, L.—(Gnat Laurel, Rose Bay.)

Mr. Lesquereux thinks it grows in Arkansas, but is not positive as he had only leaves to examine.

SOPOTACEAE.

Bumelia lanuginosa, Pers.

Common throughout the upland portions, attaining a diameter of 10 inches. Grows on cliffs and in low ground. Has received no common name.

Bumelia lycioides, Gaertner.

Said to grow in Arkansas on alluvial soil and in swamps.—(Nuttall.)

EBENACEAE.

Diospyros virginiana, L.—(Persimmon.)

Common throughout Ark., in low and high ground. Fruit used to make a domestic beer. Attains a diameter of 18 inches.

STYRACACEAE.

Symplocos tinctoria, L'Heritier.—(Sweet Leaf.)

Occurs in Ark, about Molvern and Texarkana, according to Mr. Letterman, and plentiful in S. Ark., according to Mr. L. We have specimens from Union county.

Halesia diptera, L.

We found it quite plentiful about Hot Springs, in low ground. Specimens 6 inches in diameter, were seen.

Halesia tetraptera, L.—(Silver Bell Tree.)

Credited to Arkansas in Prof. C. S. Sargent's *Trees of North America.* The observer is not known by us.

OLEACEAE.

Fraxinus americana, L.—(White Ash.)

Is common throughout Ark., in the river and creek bottoms, or occasionally in dry upland. A valuable tree for economic purposes.

Fraxinus platycarpa, Michx.—(Water Ash.)

Is not uncommon in S. and S. W. Arkansas, in river swamps.

Fraxinus sambucifolia, Lam. - (Black Ash.)

Found in swamps and along streams in the up country. Did not see it in S. Ark.

Fraxinus viridis, Michx.—(Green Ash.)

Called *Blue Ash* in Arkansas, common in the river bottoms, and also in the upland. A medium sized tree. Wood valuable.

Fraxinus quadrangulata, Michx.—(Blue Ash.)

Credited to Arkansas in Nuttall's Catalogue of Arkansas plants. It has not been rediscovered. *F. viridis* is called *Blue Ash* by the farmers.

Chionanthus virginica, L.—(Fringe Tree.)

Occurs in Southwest Arkansas. Saw specimens in Hempstead county, also in Miller county. Specimens were found 6 to 8 inches in diameter.

Osmonthus americanus, Benth & Hook.—(Devil Wood.)

Occurs in Arkansas according to Nuttall.

BIGNONIACEAE.

Catalpa bignonioides, Walter.—(Catalpa.)

Though common in cultivation, we have not seen a single tree in Arkansas that could be regarded indigenous. We have never visited the western part of Benton county where Prof. Lesquereux found it indigenous. We presume, upon examination, it will prove to be *C. speciosa* (Warder), which was not distinguished from *C. ibgnonoides* (Walt.), at the time Mr. Lesq. traveled in Arkansas. It will be interesting to look the matter up, as neither species has been found native so far West. We will endeavor to settle the question in the near future.

Catalpa speciosa, Warder.—(Western Catalpa.)

This interesting species, we suppose, grows spontaneous in the low country just west of the Mississippi River.

Inland, it occurs in Hempstead county, about Washington, attaining a diameter of 4 feet. There are several magnificent specimens in the Hotel yard, and in the private grounds of Judge A. B. Williams, at Washington. The plant seems to be naturalized, and grows spontaneously along the creeks and streams of that region. The oldest settlers tell me it was introduced from La. (More hardy, and a finer tree than the former. Mr. Jno. Teas failed to find it where it did not seem to be adventitious. Warder.)

LAURACEAE.

Persea carolinensis, Nees.—(Red Bay.)

Occurs in Southwest Arkansas, adjoining the Texan border. Will, no doubt, be found throughout the south portion of the State, as it grows in the Gulf States, as far east as the Atlantic coast.

Sassafras officinale, Nees.—(Sassafras.)

Common through the State, attaining a diameter of 3 feet, in South Arkansas. A nuisance in sandy soil, the sprouts being hard to eradicate.

The bark of the root medicinal. Drunk in the spring in the form of an infusion for "thinning" the blood. The wood but little used. Tree quite ornamental.

(To be continued in the next number.)

MISCELLANY.

Injuries from Mineral Vapors —A decision important alike to Agriculture and to Forestry has been made by the Court of Appeals of the House of Lords, in the celebrated Glencorse case. In accordance with this decision, the calcining of iron-stone, or of any thing else which emits vapors injurious to vegetation, can be suppressed on complaint of any one whose trees or crop—within one mile of the origin of the fumes, are in the least degree injured. Previous to this, in many parts of England, the owners of woodlands, as well as of grain fields, had suffered great losses without remedy. The late decision will enable them to get protection, and the principle of justice which is thus established, commends itself to the good sense of every one. There are districts in the United States where a local inconvenience is suffered from an analogous cause.

Drouths and Floods in China from the Clearing Off of Woodlands.—The Hon. David H. Bailey, late U. S. Consul General for China, in a paper read at the Cincinnati Meeting of the Am. Forestry Congress, showed the disastrous effects that have resulted from the denudation of vast tracts of country in China. He said: "Not only have the hills and plains been shorn for centuries of their trees, but of that luxuriant herbage which yearly quickening, yearly dying, should form as it does in other countries, a sponge to retain the moisture necessary for the constant fertilization of the soil."

To these causes might be attributed in a large degree, the many appalling drouths and devastating floods which had afflicted that country, and the dreadful famines which had in some years destroyed millions of the inhabitants, and of which he presented many horrible details.

A Committee of Relief, in reporting on the subject said:

"The denudation of forests, and the consequent dessication of the soil, are a well known occasion of the calamity now before us. China, as well as other countries, is grievously at fault in this respect, and the authorities and the people might well learn lessons on the point, from the painful experience through which they have lately passed."

This waste and the effects, have been growing worse every year, and yet no trees are planted and no prospect of better times could be foreseen, and he remarks: "It is a singular commentary on the inconsistency of the Chinese character to say, that they have a superstitious veneration for trees, and yet in many districts and provinces they destroy their forests. There is scarcely a village in treeless Shansi without its old sacred trees, covered with inscriptions, either cut on wooden boards, or written on slips of paper, containg the Chinese motto "*Yu-ch'in-pi-ying*—Ask and you shall receive."

The want of railroad communications, and the decay of their system of internal navigation, have prevented that equalization of supplies that might have otherwise tended at least to diminish if it did not wholly relieve these calamities, which from the records kept for more than a thousand years, show that they have increased in proportion as the woodlands have disappeared.

American Pomological Society.—This society will hold its 19th session at

Philadelphia, commencing September 12, 1883, and continuing three days. The Society is the guest of the Pennsylvania Horticultural Society, and its session will be held at the time of the 4th annual exhibition of the Pa. Hort. Soc. at Horticultural Hall, Broad street near Locust. Although no subject directly relating to sylviculture is mentioned upon the programme, there are some that have a very close relation to it, and among the active officers of the Society are many who take a deep interest in Forestry.

The Wild Cherry Tree in the Southern States.—In a letter from Prof. S. R. Buckley, of Austin, Texas, the following facts are mentioned in regard to the Wild Black Cherry (*Prunus serotina*) in Texas and other Southern States. This tree is a native of Texas being quite common in the hilly region Northwest of Austin. I once saw a tree of it in full bloom in October, a few miles below Shreveport, in Louisiana. However, it is not uncommon for some trees at the South to bloom twice in the same season, provided there is a long drouth in summer succeeded by copious fall rains. The Wild Cherry extends northwestward in Texas to the mountains of El Paso county, near Fort Davis. In Texas, the tree is seldom if ever more than six inches in diameter and thirty feet high.

Probably it attains its largest dimensions in the rich coves near the summits of the mountains of North Carolina. On Shining Rock Mountain, in Haywood county, of that State, I measured one tree of it 14 feet 6 inches in circumference at 3 feet from the ground, another 10 feet 8 inches at the same height, and several more of nearly the same dimensions. These were with straight boles and a height of 70 or more feet.

The late Prof. Troost, of Tenn., many years ago measured some Wild Cherry trees in the Smoky Mountains of Tennessee, which were from 12 to 14 feet in circumference, and with an estimated height of 90 to 100 feet. (See his 5th Geological Report of Tennessee, page 25.)

A Good Example.—Mr. Emerick Bell, of Mansfield, O., in a letter addressed to the Forestry Convention at Cincinnati in 1882, says he then had forty-five rows of Black Walnut trees half a mile long, on the west side of his farm, and the same number of Shell-bark Hickory, and Chestnut. He had done this since the November previous, at a time of year when most farmers were idling away their time in winter. He had a Walnut tree planted in 1876, that was then 27 inches in girth. It had grown from 5 to 9 feet a year, and gained an inch in diameter yearly. Mr. B. stated his intention to have growing not less than 100,000 Black Walnut trees, if his life was spared to the age of eighty-five.

Preservation of Seeds in Hot and Humid Climates.—A contributor to "The Indian Forester," in its February number has a suggestion upon the storing and care of seeds that deserves notice. He found that in hermetically sealed boxes, and in bottles with glass stoppers, the seeds became moldy from the exhalation of the natural moisture within them, especially in a warm climate. He advised placing bags of charcoal among the seeds, or at the bottom of the box, to absorb this moisture, and preferred corks to glass stoppers in bottles for keeping seeds, as less liable to injure them by molding. In bottles containing seeds apparently quite dry, he had noticed in ten or twelve days, a covering of dew within, there they were closed with glass stoppers, but not when closed by corks.

International Forestry Exhibition.—The project of an International Forestry Exhibition has been started by the Scottish Arboricultural Society, to be held at Edinburgh in the summer of 1884, and with the expectation and hope of giving a new impulse to the subject generally.

It happens that, in April next, the tri-centennial of the University of Edinburgh will come around, and the opportunity is thus offered for securing an interest in both occasions by appointing them at times that will be convenient for those who wish to attend both.

One of the results hoped for is the establishment of a British school of Forestry—the needs and opportunities of which have been so often urged, but hitherto without result. It is to be hoped that this very important measure will not be long delayed.

Working of Pine Forests for Resinous Products in Spain.—By a Royal order, dated February 17, 1883, superceding those of earlier date, certain pine forests may be leased for periods of five years; the system of working being that introduced many years since in France by M. Hugues. The size of the incisions in resinage intended for longest period of working is limited in length to 11.15 feet, and in breadth to 4.3 inches at the top, and 4.7 inches at the bottom. They are not to be more than 0.59 inches in depth. In the first year they may be opened 1.64 feet, in the second and third years each 1.97 feet, in the fourth year 2.62 feet, and in the fifth year 2.95 feet.

Bericht über das eidgenössische Forstwesen, Jagd und Fischerei in Jahr, 1882. pp. 18. [Report upon Federal Forestry, hunting and fisheries.]—The Swiss national system of forest management dates from 1874, when an amendment to the constitution was adopted giving to the Central government the right to supervise structures for the protection of water-courses and of the forest police in the mountain regions, and also the power to regulate fisheries, hunting, and the preservation of mountain game, and the protection of birds useful to land and forest culture. This report gives a concise statement of the progress that has been made under the above authority in the several cantons, and the first results of the system.

Planting Trees in School Grounds.—This is a tract of eight pages, containing a letter addressed by the editor of this journal to the Hon. John Eaton, U. S. commissioner of education, with a few general considerations upon ornamental planting, and suggestions under the heads of "Where to Plant," "What Should we Plant?" "When to Plant," "Arbor Day," "An Arboretum," and "Collections." It was written with the view of interesting the children of our schools in the subject of tree-planting, and in the hope that this impression, early formed, may be carried through life, and bring results when these children shall have become the owners of the land. An immense edition has been issued, and it can be obtained free by application to the commissioner of education at Washington, D. C.

BIBLIOGRAPHICAL NOTICES.

The Forests of England and the Management of Them in By-Gone Times. Compiled by John Croumbie Brown, LL. D., Edinburgh, 1883. 12mo. pp. xiv, 263, and 8.

There is no writer in the English language who has done so much as the Rev. Dr. Brown towards making known the systems of Forest management, and of special education in Forestry upon the continent of Europe. He made a careful survey of the flora and capabilities of the colony of the Cape of Good Hope, where he was appointed Government Botanist in 1863, and since he returned he has published voluminous works, the principal of which are as follows:

1. "Hydrology of South Africa: or details of the former Hydrographic condition of the Cape of Good Hope, and of causes of its present aridity, with suggestions of appropriate remedies for this aridity," 1875.
2. "Water Supply of South Africa and facilities for the storage of it," 1877.
3. "Forests and Moisture; or Effects of Forests on humidity of climate." 1877.
4. "Pine Plantations on Sand Wastes in France." 1878.
5. "Reboisement in France; or Records of the Re-planting of the Alps, the Cevennes, and the Pyrenneés with Trees, Herbage and Bush, with a view of arresting and preventing the destructive consquences of torrents." 1879.

The subjects under study for future publication by Dr. Brown, embrace a wide range of research in Forest Economies and the connected sciences, and they cannot fail to prove of great value to the student of Forestry wherever the English language is read. The number of special pamphlets and minor publications by Dr. Brown upon Schools of Forestry, etc., is quite considerable. He has earnestly, but thus far without success, urged the importance of establishing one or more Schools of Forestry in Great Britain, and has pointed out the opportunities presented in connection with existing institutions, and public forests for accomplishing this object to advantage, and now in the little volume under notice, he has conferred a new benefit upon Forestry by presenting in a concise historical form, an account of the various existing and former forests of Great Britain, their legislation and management. His inquiries extend back to the notices of forests in the time of the Romans and the Saxons. He gives a history of the modern Woods and Forests, with notices of their traditions and literature; the Chases, Parks, and Woods, their devastation and measures taken for their protection, and such information as can be ascertained concerning former forests and the remains of some that have been buried, and submerged in the sea.

To the reader of English history, this work will afford a convenient book of reference;—to those who take pleasure in tracing the origin and growth of ideas upon the protection and uses of forests, it presents a most interesting theme for study, and to those who regard the question of game as an important element in the maintenance of forests for its protection, it will afford much information, and lead to a great deal more, in the ample citations that it contains to all the more important literature that exists in our language upon this subject.

Proceedings of the American Forestry Congress, at its Sessions Held at Cincinnati, Ohio, in April, 1882, and at Montreal, Canada, in August, 1882. With a Notice of the Organization of the American Forestry Association, United with it at the Montreal Meeting. Published Under the Direction of the Executive Committee. Washington, 1883. pp. 44.

This is a journal of proceedings, with Reports, Constitution, lists of papers presented, and a list of members; but it does not contain any of the papers read. Every member is entitled to a copy, and it has been mailed to every one whose address was known. It will be sent to such members as have not received it, upon notice being given to the editor of this Journal at his home residence in Lowville, New York. The preparation of this document has been somewhat delayed, in order that every point in the early history of this organization might be fully settled, to the satisfaction of all concerned, and it may hereafter be regarded as an authentic statement of the beginning, of what we trust may hereafter become a long and unbroken series of publications by the American Forestry Congress, each surpassing the one before it, in size, value, and numbers in the list of membership. We feel assured that at a future time, not distant, the society may be able to publish in full, or in abstract, the papers that for the present can be noticed only by their titles, and that this publication may become a most valuable agency for advancing the objects for which it has been formed.

The Woods and Timbers of North Carolina. By P. M. HALE. A compilation from the Botanical and Geological reports of Drs. Curtis, Emmons and Kerr, to which are added information obtained from the Census Bureau, and accurate reports from the several counties. Raleigh, 1883. 12mo., pp. 272, with a map of the State.

This little work reproduces the report of the Rev. M. A. Curtis on the Woody Plants of North Carolina, occupying nearly two hundred pages, the remainder being made up chiefly from the Reports of Prof. W. C. Kerr, and replies to inquiries addressed to the several counties. It brings into convenient and accessible form a considerable amount of information not otherwise readily obtained, and will be useful to those in search of facts upon the woods of that State.

Preliminary Report on the Forestry of the Mississippi Valley, and Tree-planting on the Plains. Washington, 1883. 8vo. pp. 45.

This pamphlet, issued by the Department of Agriculture, contains two reports; one from F. P. Baker, of Kansas, occupying the first 36 pages, and the remainder from the Hon. Robert W. Furnas, of Nebraska. In the former there is given a general outline of the extent of native woodlands and of treeless plains between the Mississippi and the Rocky Mountains, with statements from various correspondents, and a particular account of the results of Timber-culture under the acts of Congress intended for its encouragement, passed in 1873, 1874, and 1878. He presents the opinions of various officials under whom the entries for Timber-culture have been made, and repeats in substance the objectionable features of the law, which were presented in the Forestry Report of 1877, and that have often since been confirmed by various writers upon this subject. This fault consisted in the neglect to provide that land once entered for Timber-culture, should not thereafter, in case of failure or abandonment by one party, be subject to entry under any other form of title by another. The defects of the law are strongly stated in the Report of the Commissioners of the General Land Office, quoted upon page 283 of this JOURNAL, and a reference will be sufficient for their understanding.

After stating some general facts upon the necessity of irrigation, and the extent to which it may be practiced, Mr. Baker proceeds to give the results of planting upon the Western plains, citing the accounts given by Mr. Longstreth, of Kansas, and others, and makes sundry suggestions concerning the protection of timber upon the public lands, the establishment of experimental stations, the duty of railroad companies, and the advantages of planting by the owners of land generally.

The latter portion of this pamphlet, by Mr. Furnas, contains much valuable information in a concise form relating to the native varieties of timber trees, the characteristics of some of the more important ones, a table of measurements of growth, the order of preference, modes of planting and management, some of the injuries to which plantations are liable, and the importance of favoring the spontaneous growth of trees. He recommends as a general rule the planting of trees at intervals of four feet at first, in rows each way, with a view of cutting out, first one-half, and then half of the remainder, as the growth requires it and the trees become crowded. From the results of a calculation that he presents, including an estimate of the spontaneous growth, he concludes that over 605½ millions of trees have been started by artificial means, or by natural seeding, within the State of Nebraska, during the last twenty-eight years. The extensive experience and observation of Mr. Furnas upon this subject, will give confidence to his statements, and afford strong grounds of inducement for more extensive planting throughout the more western of the prairie States.

In the order of tree-planting in Nebraska, numerically stated, he places the trees of that region in the following order, viz.: Cottonwoods, Box Elder, Soft Maples, Elms, Ashes, Black Walnut, Honey Locust, Catalpa, Oaks, Hickories, Kentucky Coffee, Hackberry, Mulberry, Black Cherry Tree, Black Locust, Larch, Sycamore, and Willows. Two-thirds of the whole are Cottonwoods, because most easily obtained, cheapest, of most rapid growth, and surest almost everywhere they are planted.

Of spontaneous growths in the order of value, he places Oaks, (Red and Black perhaps predominating); Hickories, (more shag-bark than others); Black Walnut, Elms, Linden, White Ash, Mulberry, and Hackberry on higher lands;—on bottoms, Cottonwoods, Box Elder, Willows, Sycamores, Soft Maples, Green and Water Ash.

In the order of ultimate value generally, he arranges deciduous trees as follows: White, Burr, and Chestnut Oaks; Black and White Walnuts; White, Green, and Blue Ash; Black Cherry, Catalpa, Black Locust, Honey Locust, Kentucky Coffee Tree, Elms, Hickories, Larch, Soft Maple, Hackberry, Mulberry, Cottonwoods, Willows, and Box Elder. For present or near value, the Cottonwoods, especially the Yellow, are almost always preferred. There are two species, the Yellow, (*Populus monilifera*), and White, (*P. heterophylla*), the former making excellent lumber, particularly for inside uses, not exposed to the weather. For shingles, only Pine, Cedar, or Walnut are superior. Both make good fuel after reasonable drying or seasoning. Old steamboat and mill men prefer half-seasoned Cottonwood to any other obtainable in that region, claiming that they get more steam from it. Much is also used in burning brick, and no other wood holds nails so well.

Of the coniferous species, the first preference is for the Red Cedar, after which come the White, Scotch, and Austrian Pines, in the order of value, and as usually planted. These estimates apply particularly to the State of Nebraska, but would probably apply to the adjoining portions of Iowa, Kansas, and Dakota, without material change.

Shade Trees, Indigenous Shrubs and Vines. 2d Ed. Revised and Improved. By J. T. STEWART, M.D, Peoria, Ill., 1883. 8vo. pp. 37. This is an eminently practical description of the principal native trees, shrubs and vines, growing around Peoria, with suggestions concerning transplanting, pruning, and management, especially in the streets of cities and villages. In his concluding remarks he notices the hygienic effect of properly shaded and ornamented streets, by reducing the temperature in summer and in affording shelter from the glare of the sun, and the discomfort of dusty and sun-burnt streets. In a street eighty-five feet wide, a drive-way of thirty-five feet in the middle is enough for all uses. This would allow of eight feet sidewalks, and give ample room on each side for grass-plats, flower-beds and trees, thus adding immeasurably to the comfort, healthfulness, and beauty of the place, while it still afforded ample room for driving everywhere.

Woody Plants of Ohio, Arranged Under their Appropriate Botanical Orders. With Remarks upon their Uses, Qualities and Sources. By JNO. A. WARDER, Pres. American Forestry Association assisted by DAVIS L. JAMES and JOSEPH V. JAMES, of the Cincinnati Soc. of Natural History. 8vo. pp. 40. Presented at the Meeting of the Agricultural Convention of Ohio, in Columbus, January, 1882.

This is a systematic catalogue of wood bearing plants, with their botanical and common names, and remarks concerning their range, size, and economical uses. It includes such introduced species as are found to grow in the open air.

Forestry; a Magazine for the Country. Edited by Francis George Heath. Author of "Autumnal Leaves," "Our Woodland Trees," "The Fern World," etc., etc.

Under the above title, and in a new dress, our English cotemporary, late "The Journal of Forestry and Estates Management," begins its new series and seventh volume. The May number before us, contains 80 pages of text; has a considerable amount of pictorial illustration, and in typographical execution and paper, it shows a marked improvement upon the preceding volume. Being under the same editor and publishers, it promises to be well sustained in its editorial and business departments, and we cordially wish it abundant success.

Der Frostshaden des Winters 1879-80. *und des Spätfrostes von* 19, 20 *Mai*, 1880, *an den Holzgewächsen in der Schweis.*—[Injuries to wood-growth in Switzerland, from the Frost in the Winter of 1879–80, and from the late frost, May 19, 20, 1880.] By T. Coaz, Federal Forest Inspector, Bern, 1882. 4to. p. 176.

The extraordinary damages resulting from these frosts, led the Swiss Federal Government to issue, on the 8th of December, 1880, a circular to its forest agents, making particular inquiries concerning these injuries, and the report before us contains the results of this investigation. An entire season had in the meantime passed, and it was thought that the permanent effects of the cold would be fully known. The report contains a map of Europe, marked with isothermal and isobarometric lines, and with the prevailing directions of the winds within the period between the 14th and 28th of December, 1879, showing a progressive increase of pressure from 755 mm. on the outer margin to 780 in the center, and an increase of cold like progression amounting to —20° Centigrade (—4 F°) near the same central point.

It is to remarked that in this, as upon other occasions, the disaster was due quite as much to the condition of the trees and to the formation and ripening of their wood, as to the intensity of the cold. The effects were most severe in valleys liable to fogs, and upon southern slopes where the sun could strike the trees while frozen. In the latter case, the bark would become loosened and fall off in great sheets, while with a northern aspect, and with more exposure to the winds, the injuries were less. In some cases where deciduous trees were killed down, the stump would put forth an abundant crop of shoots from near the roots, and in young plantations, by cutting back, there still remained a fair promise of growth from the roots. The Beech showed no signs of recovery in this way, the bark on the south side cleaving off, and the dead leaves being retained. There was generally an increased tendency to sprout from the roots.

The frost of May 19–20, killed the leaves of young firs and spruces very generally. Those exposed to the sun suffered much more than those in the shade, and, in many instances, the white firs from 25 to 60 years old were cracked so badly that they were cut down, as not promising a future value, although still partly alive. This report gives in detail the facts and opinions of a great number of observers, and presents, in tabular form, a list of species observed, the elevation above tide, actual and comparative amount of injury in various localities, and remarks.

Essai sur les Repeuplements artificiels, et la restauration des vides et clairières des Forets.—[Essay upon artificial replanting and filling of blanks and clear spaces in the forests.] By Arthur Noel, Paris, 1882. 8vo. p. 352, and three plates.

This work was prepared under the inducements offered by the society of French Agriculturists for an essay on the best methods for securing, with certainty, the replanting of small open spaces in woodlands. It presents an admirable summary of methods for replanting generally, and deserves the careful study of all who desire information upon this subject.

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JULY, 1883.

FORESTS AND FOREST TREES OF TEXAS.*

BY T. V. MUNSON, OF DENISON, TEX.

ARCTOSTAPHYLOS, *tomentosa*, (Mountain Mahogany, or Mansinita—little Apple,) a beautiful broad-leaved evergreen, closely allied to the Laurel of the East, but attaining from 15 to 30 feet. The wood is very hard and admits of a high polish. It is found on the hills and mountains of the Presidio river and westward to California.

Nearly all the growth in Western Texas, toward the Rio Grande, presents a low, scraggy, thorny aspect. *Acer rubrum* (Red or Swamp Maple), common in bottom lands of Eastern Texas. Fine as an ornamental tree, but of little value otherwise. Very abundant along the Angelina, Neches, and Sabine rivers. *A. saccharinum*, chiefly on the hilly lands along the last above-named rivers. It is also reported in Bandera County, Western Texas. *A. Negundo*, or *Negundo aceroides* (Ash-leaved Maple, or Box-Elder), occurs on all streams of mentionable size in the State, east of the meridian of San Antonio. Trees two feet in diameter and 70 feet high are occasionally found. It is more extensively and successfully planted on the uplands throughout the State than any other of the Maple family.

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* The alphabetical, rather than scientific arrangement, according to natural orders, is chosen as being simpler and easier for reference.

Frequently species which are only shrubs are mentioned when there are trees in the same genus, or when of sufficient importance to be worthy of mention. This, it is presumed, will be no detriment, as often persons are as much or more interested in shrubs or small trees as they are in some large trees, and find them occasionally of more real value.

The Soft, White or Silver Maple (*Acer dasycarpum*), does not occur native, so far as learned, but succeeds quite well in deep, rich soils.

Æsculus arguta [Buckley]. Cherokee county, East Texas.

Æ. pavia (Red Buckeye). Near streams, East Texas.

Algarobia glandulosa (Mesquit, or Texas Gum-Arabic Tree). This deserves more than mere mention. It occurs in all the prairie country of Central Texas, westward from the Navasota river, and southward from the Trinity, in North Texas, to the Table Lands ("Staked Plains"), and far across the Rio Grande into Mexico.

It is generally a scraggy shrub, but in some places grows 25 or 30 feet high, and 8 to 20 inches in diameter. Groves or forests of it (I hardly know which to call them), at a little distance, present the appearance, when out of leaf, of an old, dilipidated Peach orchard. Though the top is generally so small, yet the roots are exceedingly bulky, of a firm heavy texture, possessing intense heat-producing properties. It can be used green in the forge with almost equal effect as charcoal. Like Hickory and some other woods, it rapidly destroys a stove or grate. It is the chief fuel of a vast region in the grazing portions of the state. It does not interfere with the pasturage. On the contrary, the pods, with their bean-like seeds, are greedily eaten by the stock, which rapidly fatten on them when in sufficient quantity. The roots, when dug and delivered, usually bring $6 to $10 per ton, and serve as good a purpose as so much coal.

The wood above ground, as well as of the roots, is heavy, firm, and admits of a high polish, and would make a fine veneering for furniture. Most of the region occupied by it will necessarily remain a great grazing ground, and this will be the only timber and fuel, except what may be imported. In its native regions, where cultivated lands have been abandoned, the Mesquit springs up and occupies the land. It makes a very durable fence post.

Amelanchier Canadensis (Service Berry, June Berry, etc).

Eastern Texas, along streams, also mountains, Western Texas.

Asimina triloba (Papaw). Found occasionally on Red river and in Eastern Texas.

Betula nigra (Black Birch). Eastern Texas. Near Palestine, Anderson county, I saw specimens 50 to 80 feet high, and 12 to 24 inches in diameter, with straight, smooth bodies.

Bumelia lanuginosa (Leatherwood, Shittah or Chittimwood, Southern Buckthorn). Chiefly in Eastern Texas. There is a variety, (*lycioides*,) in Northern Texas, along Red river bluffs and tributaries. Height 25 to 50 feet, wood almost worthless, but the young plants will make a hedge, little inferior to Osage Orange. *B. reclinata* occurs on the Rio Grande, with larger fruit than the above.

Carpinus Americana (Hornbeam). Occasional in South-eastern Texas, 15 to 30 feet.

Carya alba (Shell-bark Hickory). Plentiful and large in localities, Eastern Texas.

C. amara (Bitter, or Swamp Hickory). Streams, Eastern Texas.

C. Buckleyii [Durand], (Black Hickory), a larger tree than *C. tomentosa*, closely resembles it in general aspect. Common throughout all the Post Oak region of Texas, but most abundant on rich, loamy, sandy land. Regarded as a mark of good fruit-soil in North and East Texas. Nut very sweet, with rather thin hull, but thick inner shell, 50 to 75 feet high. Wood usually knotty and hard to split. Makes excellent fire-wood.

C. glabra (Pig-nut). Streams, Eastern and Northern Texas. Extends further west than the three preceding.

C. myristicæformis [Mx.], (Nutmeg Hickory). Central and Southern Texas.

C. olivæformis (Pecan). Found near all fresh water, where timber grows, throughout the State. On the headwaters and tributaries of the Trinity, Brazos, Colorado, Guadalupe, San Antonio, and Nueces rivers, are gathered the celebrated Texas Pecans. The trees in the bottom lands of these rivers—except the last three, where they are smaller and more scraggy—often attain to 3 and 4 feet in diameter, and 75 to 100 feet in height. There are fine bodies of this timber along

Red river, which will afford ample material of this kind for carriages, wagons, handles, etc., for a long time. The trees are protected by a special statute from the ax of nut-hunters, who often fell large trees for a single crop.

It is an easy timber to cultivate in artificial forest, and doubtless the time is not far off when improved varieties will be propagated by budding and grafting in the nursery, and large plantations made for the commercial value of the nuts. An orchard would come into bearing here in six to eight years; and, when once established, would be good for centuries, and as profitable as almost any other tree-fruit, exclusive of the constantly increasing value of the timber.

There is a single tree, some two feet or more in diameter, and 75 or 80 feet high, standing in an open field two miles north-east of Denison, bearing the general appearances of the species, except the nut, which is under average size, and has a lighter color, and a much harder and thicker shell than usual, and a flavor resembling the Shell-bark Hickory. I have regarded this merely as an uncommon variety, till recently, at New Orleans, at the meeting of the Miss. Val. Hort. Society, Mr. Holsinger, of Missouri, I believe, exhibited a similar nut, though larger and better, the tree of which resembles the Pecan. Prof. S. M. Tracy, the former secretary of the society, and Professor of Botany in the State University, Columbia, Mo., told me that two or three such trees, from various sections, had been made known to him, and that he was inclined to regard them as hybrids of the Pecan with other species of Carya. Can this not be a new species?

C. sulcata. Said to occur in Eastern Texas.

C. tomentosa (Mocker-nut, Bull Hickory). Northern and Eastern Texas. Scarce.

Castanea pumila (Chinquapin). Southeast Texas.

Catalpa speciosa. Though not native, that I can learn of, yet it is perfectly at home, and in neighborhoods on Red river, where it was introduced from Arkansas thirty or forty years ago, it is spreading into the woods. It is of the easiest culture here in the nursery, on the street, and in artificial forest. It certainly will play an important part in the improvement of Texas praires, as elsewhere further north.

The *C. bignonioides* grows equally well, but does not make such fine trees.

Celtis occidentalis (Hackberry). } Both species occur in
C. Mississippiensis. } rich timber-lands throughout the state.

C. pallida. Found in Western Texas, along the Rio Grande.

Cerasus capollin (Texas Wild Cherry). Mountains Western Texas, 20 to 30 feet.

C. Caroliniana (Mock Orange, Wild Peach). This beautiful broad-leaved evergreen occurs along the various streams of South-east and South Texas, and is much cultivated in yards as specimens, or in hedges for screens. It bears shearing well.

Cercis Canadensis (Red-bud). Occurs in the limestone timbered-land throughout the State, but most abundantly in Northern Texas.

Chionanthus Virginica (White Fringe Tree). Near Houston on Buffalo Bayou.

Cornus Florida (Flowering Dogwood). Common in bottom lands in East and Central Texas, along Red river, and Northward in Indian Territory.

C. alternifolia, C. paniculata, C. stricta and C. sericea. Along streams and in swamps in Eastern and South-eastern Texas. Shrubs.

Cratægus (Red Haw). Numerous species are found throughout the shrubby lands of the State, but mostly in Northern and Eastern Texas.

Diospyros Virginiana (Common Persimmon). Abounds all through North, East and Central Texas. The fruit is usually larger and finer than this species produces further North, and occasionally a variety is found with fruit from 1½ to 2 inches in diameter, of excellent quality, ripening in August and September. A Dr. Durr, while hunting, several years ago, found such on the Colorado river in an isolated grove, all alike, from which he saved seeds and distributed among friends in Burnet county. The seeds were planted and trees are growing, from which fine fruit is expected. These are known as the "Dr. Durr Persimmon."

D. Texana (Black Persimmon). Is found in South-western

Texas, and in Mexico. It is not equal to the Common in fruit or wood. The fruit being black when ripe, gives the common name.

Fagus ferruginea (Beech). Of fine size on the Neches, Angelina and Sabine rivers, Shelby county, etc.

Frangula Caroliniana (Alder Buckthorn). Along streams, Northern and Eastern Texas.

Fraxinus Americana (White Ash). Occurs along most streams of the State. Especially large in bottoms of Red river and other streams in Northern Texas, with limestone soil.

F. pubescens. Northern Texas, in ravines on high land.

F. quadrangulata. Eastern Texas, forest region.

F. viridis. Eastern Texas.

All the Ashes are more or less adapted to artificial forest-culture in Texas, and the wood seems to have a firmer and tougher texture than further north, thus making it very valuable for handles and machine building.

Gleditschia triacanthos (Honey Locust). In variety, found more or less in all timbered belts, especially in bottoms. Valuable for forest-culture.

G. monosperma. South-eastern Texas, swampy bottoms, small, and not as valuable as the common species.

Gymnocladus Canadansis (Ky. Coffee Tree. Eastern Texas.

Hoopesia arborea [Buckley]. Grows on hills near the gulf, 1½ miles below Corpus Christi, and probably other localities near the mouth of the Nueces river. Twenty to twenty-five feet high, 8 to 12 inches in diameter. Bark of trunk and branches smooth, of a pale-green color. Makes a beautiful, spreading, compact shade-tree. Leaves bi-pinnate 1 to 3-paired, leaflets 3 to 6-paired. Flowers, axillary; solitary, yellow, with reddish-brown lines near the base of petals.

Ilex ambigua. A small tree, South Texas, deciduous.

I. Cassine (Cassena or Yaupon: Indian and Mexican Tea-Shrub). East and South Texas, evergreen.

I. decidua. Common on lime soils along streams all through North and Central Texas. In mild winters nearly evergreen, and it retains its scarlet berries in great profusion and brightness nearly all winter. A beautiful shrub.

I. Dahoon. Swamps, near the coast.

I. opaca (American Holly). South-eastern Texas.

Juglans nigra (Black Walnut). More or less on all alluvial bottoms of Eastern, Northern, Central and Southern Texas.

J. rupestris (Dwarf Walnut). Occasional along streams westward from Austin, on the Slano, Concho, Devil's, and Pecos rivers.

Juniperus Virginiana (Red Cedar). In Eastern Texas, places along Red river, the Trinity, Brazos, Colorado, and their tributaries, it is quite abundant and furnishes vast numbers of telegraph poles, fence-posts, etc.

J. occidentalis (Mountain or Western Cedar, Oregon Cedar). Appears in its eastern limits near Austin, and occurs in the hilly and mountainous country westward, on the Pecós, Rio Grande, New Mexico, on to California and Oregon. In Texas it grows from 10 to 50 feet, according to locality. The wood is very firm and durable.

J. pachyphlœa [Torr]. Hill-sides, Western Texas, New Mexico, and Mexico, 10 to 25 feet, spreading, scraggy, often forked near the ground. Bark, thick and checked, resembling the bark of pine. Fruit large, sweetish, edible. Would make a pretty ornamental tree.

Larix ————. Low, spreading, pendulous. Found along the beach near Galveston, and is extensively used on the island next the gulf as a wind-break against the sea-breeze, and is said to take up the excess of salt from the air, so that other trees and plants will grow readily behind it, whereas they perish without its interposition. Small branches plucked and cast upon the wet sand of the beach quickly take root, and if unmolested rapidly grow to a height of 15 to 20 feet. The sprays, if drawn through the mouth, have quite a salty taste. It will grow into a beautiful and compact hedge if properly planted and sheared.

Liquidambar styraciflua (Sweet-Gum). One of the most abundant and finely proportioned trees along all the large streams in South-eastern Texas. Excellent for trays, butter-molds and other utensils needing tough, light wood. Not otherwise valuable as a timber, but is a fine shade-tree in moist soils. Handsome.

Magnolia acuminata (Cucumber-Tree). Sparingly in North-eastern Texas.

M. fuscata (Banannа Shrub). Jasper county, Sabine river (?). Cream-colored flower, exceedingly fragrant.

M. glauca (Sweet Bay). Confined to the swampy lands of the Neches, Angelina, Sabine, and lower Trinity. Sometimes attains to 50 or 60 feet. Nearly evergreen.

M. grandiflora. Found in bottoms from 50 to 100 miles inland from the gulf, and extending from the Colorado eastward into Louisiana. Some places along the lower Trinity, in Trinity, Walker, San Jacinto, and Polk counties, it attains to two and three feet in diameter, and to 60 or 70 feet high.

Maclura aurantica (Bois d'Arc, Osage Orange). This valuable tree is naturally confined to central Northern Texas, and 50 to 75 miles northward of Red river, in the Indian Territory, but it is grown easily and rapidly to fine size in all settled parts of the state, as elsewhere. It reaches its greatest size along the streams in Dallas, Collin, Hunt, Fannin and Grayson counties. Have seen specimens from 3 to 4 feet in diameter, and 60 to 70 feet high. For further remarks on this invaluable species, see "The Osage Orange as a Forest Tree," in the Kansas State Horticultural Society's Forestry Manual for 1881.

Morus rubra (Red Mulberry). Along alluvial bottoms throughout the state. In Eastern Texas it grows to large size, but in Western Texas it dwindles almost to a shrub, yet is very prolific of fruit in this form. There are several well marked varieties. One of these found in Cherokee county by Dr. F. L. Yoakum, produces a fine fruit almost a month earlier than other kinds.

M. microphylla [Buckley]. On hills, vicinity of Austin and westward. From 12 to 20 feet high. Fruit black, sour, very rough, ripe last of May.

Melia Azedarach (Pride-of-India, China-Berry Tree). Though this doubtless is an introduced species, yet scattered specimens are found in the forests miles away from any habitation, and of largest size. Along Red river and in Eastern Texas I have seen such, and in the Brazos bottoms, and along Buffalo bayou, below Harrisburg, it has long been found as a forest tree.

A variety, *umbraculiformis* (Texas Umbrella Tree). Was first brought to notice about 40 years ago by J. Burke, Sr., of Houston, Tex., who found a tree of this form growing on an old place in the woods near Buffalo bayou. It grows rapidly when young, and almost equally well in all portions of the state. It is very easily transplanted and makes a dense, dark, glossy umbrella-head without pruning. It has not proved hardy in Kansas, though quite so in Northern Texas and Southern Indian Territory. The tree is short-lived and rather easily broken by hard winds; yet, for a quick, perfect, handsome shade, I know nothing to take its place where it will grow well. By planting alternately with it, some long-lived, hardwood tree, almost an immediate effect can be had, and when the Umbrella Tree begins to fail, the long-lived tree is ready for service.

Nyssa aquatica. South-eastern Texas swamps. Small tree usually, but occasionally large. In low pine-barren swamps, shrubby.

N. capitata (Ogeechee Lime). Small tree in swamps near the coast. Fruit about an inch long, agreeably acid. Mrs. Young's "Flora of Texas;" but Prof. Mohr, of Mobile, says it has only been observed in Western Florida.

N. Caroliniana. Neches river, and eastward. Probably the same as *aquatica.*

N. multiflora (Tupelo, Sour Gum, Black Gum, Pepperidge). From the Colorado through Eastern Texas. In Anderson, Cherokee, Rush, and adjoining counties, it grows to large size.

N. uniflora (Large Tupelo). Found in the swamp lands of the same region with *multiflora* and grows to much larger size, even equaling the Bald Cypress growing by its side. Makes superior hollow-ware.

Ostrya Virginica (Hop-Hornbeam). Occurs much in the same localities, of about the same size, 20 to 30 feet, as the Hornbeam (*Carpinus Americana*), though it likes a dryer soil.

Pinus australis (Long-leaved or Yellow Pine). This grows to the grandest proportions, and constitutes the finest forests in the state; occurring in San Jacinto, Liberty, Polk, Hardin, Tyler, Jasper, Newton, Angelina, San Augustine, Sabine, Nacodoches, and Shelby counties, and eastward into Louisiana. Immense quantities of timber are sawed in all these counties, and carried, on the newly-built railroads, westward to the cities and towns in the prairie lands, for the various building purposes.

P. edulis. A valuable timber tree found in the mountains of Presidio and El Paso counties, 40 to 80 feet high.

P. mitis [Michx.], *P. variabilis* [Purch.] (Short-leaved Pine.) Found in the same region as the Long-leaved Pine, and extending further north and west, producing large quantities of firm, fine-grained, non-resinous lumber.

P. taeda (Loblolly or Old-Field Pine). Found extending in great forests northward and westward from the region of the Long and Short-leaved Pines, from 50 to 100 miles. Its western limit is an isolated forest near Bastrop, in Bastrop county, on the Colorado. Next east of this it occurs in Austin county, on the Brazos, thence its western border runs up the Navasota to its head waters, from which it bears northeast through the counties of Freestone, Henderson, Van Zandt, Rains, Hopkins, and Red river, into the Indian Territory and Arkansas. It grows quickly to immense size, and, like the Short-leaved Pine, when the old forests are cleared away, it at once sends up a young growth which, if protected, would, in the course of a generation or two, be again ready for the ax. Here is a large practical field for legislation—to protect these young forests from fires and other destructive agents. The land usually is worthless for other purposes.

Planera aquatica (Planer Tree). Twenty to thirty feet high, in river swamps South-east Texas.

Platanus occidentalis (American Plane, Buttonwood, Sycamore). Timbered bottoms in all parts of the State. It is used much as a street tree in many towns of Eastern and Southern Texas, succeeding finely. Should be more planted.

Populus angulata. Chiefly in Southern Texas, and closely allied to *P. monilifera* (Cottonwood). Occurs along the larger streams throughout the State, and across the Rio Grande into Mexico. Owing to its easy growth from transplanting or from cuttings, and its rapid growth in all soils, it must ever play an important part as a beginning-tree for wind-breaks and shelter to kinds more difficult to start.

Prunus Americana. Streams, North-western Texas, "Panhandle."

P. Chicasa (Chickasaw Plum). Is found wild in all parts where other trees grow, but especially along the western streams, the head waters of the Colorado, Brazos, Trinity, and Red rivers, to the Staked Plains, and is said to produce as fine wild fruit on some trees as the Wildgoose Plum, several of which have been introduced. There are varieties beginning to ripen as early as the Alexander, and others as late as Smock Peaches. To this species the West and South look chiefly for their successful plums. Valuable hybrids have already appeared, and no doubt others of greater merit will follow. The earlier ones take the place of the Cherry here, which fruit has usually been unreliable.

P. glandulosa, *P. pumila* and *P. pygmæ*, are dwarf, worthless species, usually growing in poor, sandy soils.

P. umbellata (?) The species I speak of now is usually regarded as *P. Americana*. But I have, growing in my grounds, a number of varieties of *P. Americana*, viz: Miner, from Pennsylvania; Weaver, from Iowa; Clinton, origin not known to me; Deep Creek, from Kansas; Minetonka, Wazata, etc., from Minnesota; Yosemite, red and yellow, from Utah, and others from various sections. Yet this species does not at all agree with *Am.* in its characters, except the tree, when shed of leaves, strongly resembles it, but grows to larger size, having seen specimens 30 to 40 feet high, and 8 to 12 inches in diameter.

I sent samples of leaf, branch and fruit, to Prof. Thomas Meehan, who pronounced it *P. umbellata*; but Elliott, who classified *P. umb.*, gives a somewhat different description than what is applicable here. He says, for *P. umb.*, leaves 1 to 1½ inches, while in this they are from 2 to 4 inches; and he says the fruit is rarely half an inch in diameter and ripens in August, while this has fruit fron ⅝ to 1 inch, and usually ripens late in September or first of October, hanging on till frosts come. It has a very heavy, white bloom; while *Americana* has little or none. In this it agrees with *umbellata*. It is rarely known to sprout from the roots, even when plowed around in fields, where specimens have been left in clearing; while *Americana*, *Chicasa*, etc., sprout very badly. I hardly think the critical eye of Prof. Meehan would have been deceived, and conclude that Elliott's description of the species was not quite broad enough. This species is common on the timbered lands of Northern, Central and Southern Texas, having learned of it in Victoria county through Mr. G. Onderdonk. It extends northward into the Indian Territory, and seems to occupy about the same region, probably a little broader than the Osage Orange. We are experimenting with it as a stock for Plum and Peach, with every indication, so far, of proving the best sproutless Plum stock yet tried. It grows very thriftily, so as to keep up with the Peach, and takes the bud or graft of Peach and other Plums, as *they do it*, very readily. Have sent seeds and scions to nurserymen in various parts of the country for experiment. It will grow in wet and "dead lands," where the peach will not thrive; and, though not entirely exempt, it is rarely attacked by the "Borer."

Quercus alba (White Oak). There is a belt of this extending mainly from Hopkins county, in North-eastern Texas, down the higher lands adjoining the Sabine and Neches (which soils are a fine red sandy loam on red clay foundation) for 200 miles, more or less, turning westward in Newton and Jasper, thence, in a narrow belt of very fine timber, to Montgomery and Walker counties, with some scattering further. Hon. W. R. Harris, of Sulphur Springs, Hopkins county, told me he had split *from one tree* 40 *good railroad ties* (narrow gauge), and that the White Oak in his section was remarkable for its large proportions and excellent quality. This species is not found in Central, Western or Northern Texas, so far as learned by me.

Q. aquatica (Water Oak, Spotted Oak). In Eastern Texas, it having alternate belts or spots of black and white on the body, by which it can be distinguished from quite a distance. It is almost evergreen in North-east Texas, and quite so in South-east Texas, where a poor observer would suppose it to be Live Oak, *Q.* virens. Var. *hybrida*, a larger tree than the regular species, with ash-colored branchlets.

Q. castanea (Chestnut Oak, Yellow Oak). Rocky woods, East Texas.

Q. Catesbaei (Turkey Oak, Sand Jack.) Dry pine-barrens, East Texas.

Q. cinerea (Upland Willow Oak, Blue Jack). Pine-barrens, East Texas.

Q. coccinea (Scarlet Oak). Valuable, strong lands, North and East Texas.

Q. Durandii [Buckley], (Texas White Oak). Banks of streams in Middle and Southern Texas, 40 to 50 feet. A valuable timber. Also found in Alabama (Dr. Mohr).

Q. Emoryii. On the Pecos and Limpio, Western Texas. Beautiful shrubby evergreen.

Q. falcata (Spanish Oak). Eastern and Southern Texas. Var. *pagodæfolia* [Elliot] has larger leaves, with 11 to 13 lobes. Dry woods.

Q. Georgiana [M. A. Curtis]. Dry woods, 6 to 8 feet, in clusters, Eastern Texas.

Q. imbricaria (Shingle Oak). Mountains of Western Texas.

Q. lyrata (Overcup or Swamp White Oak). Northern and Eastern Texas, in rich lowlands. A large tree.

Q. macrocarpa (Burr-Oak, Mossy-Cup Oak). In great variety and of large size, along rich bottoms, Northern and Eastern Texas.

Q. Michauxii (Basket Oak, Cow Oak, Swamp Chestnut-Oak). Have observed only two or three specimens, near Red river, in Grayson county. These, and their seedlings, now growing in my grounds, would suggest the idea of hybridation between the Burr-Oak and Rock-Chestnut Oak, from the varying form of leaves, fruit, and their favorable proximity for mixing. But the abundant occurrence of this valuable species in Eastern Texas and other Gulf states forbids the idea of hybridation. It occurs in Texas as far west as the Trinity river. From 60 to 90 feet.

Q. montana [Willd], *monticola* [Mx.] Found in the hilly parts of Western Texas. Probably only a variety of *Q. prunus.*

Q. nigra (Black Jack). Occurs all through Eastern, Northern and Southern Texas, in great and almost worthless abundance, as the wood is of little value. On Medina Creek, above San Antonio, seems to be the most westerly point on which it has been found.

Q. oblongifolia. Mountains of the Limpio, Western Texas, westward to California. In Texas it is shrubby, 6 to 15 feet, but grows 20 to 30 feet high in California.

Q. obtusiloba [Mx.], *Q. stellata* [Willd.], (Post Oak). Found more or less on all dry, sandy lands in the eastern portions of the state, especially abundant along both sides of Red river, in the Lower (Grayson, Cook, and Denton counties) and Upper Cross-Timbers (Montague, Clay, Jack and Palo-Pinto counties), across the head winters of the Trinity and Brazos. There are large bodies of it in North-east Texas. These forests are composed chiefly of fine specimens of this valuable Oak, but *Q. nigra*, *coccinea*, *prunus*, and other species of tree, are intermingled. A variety, *breviloba* (which Emory, with doubt, places here), occurs in the mountain gorges of Western Texas. Var. *parvifolia*, a shrub or small tree, on sand ridges near the coast.

Q. palustris (Pin Oak). South-east Texas.

Q. Phellos (Swamp Willow Oak). Eastern and Southern Texas.

Q. prinus (Swamp Chestnut Oak). Abundant along the rich bottoms of North-east and Middle Texas. Valuable for timber. It would especially make a beautiful furniture, from its being so beautifully waved in grain, and allowing a high polish, but the "old settlers value it highly for its heavy masts, which often will fatten hogs nicely without corn: var. *discolor* or *bicolor* (Swamp White Oak of the North), also occurs. The species seems very variable, according to soil and locality, scarcely two trees are found identical in leaf or fruit.

Q. prinoides (Chinquapin Oak). San Jacinto river, eastward.

Q. rubra (Red Oak). Common in Eastern Texas.

Q. San Sabiana [Buckley], (Shin Oak, Post-Oak Runner). San Saba county, northward, shrubby, 3 to 15 feet.

Q. Texana [Buckley]. Hills about Austin, close grained, large, valuable.

Q. tinctoria (Black Oak, Yellow-Barked Oak). Common in Eastern Texas.

Q. virens (Live Oak). This species finds a genial, broad home in Texas, extending, where other timber occurs, from the lower Trinity, westward and southward, keeping within about 50 miles of the coast, and rising in the grandest specimens and forests known of the species, as it crosses the Brazos, and especially on the Colorado, where it attains from 75 to 100 feet high and 4 feet in diameter. But it is of lower and more spreading habit further south along the Guadalupe, San Antonio, Nueces, and the smaller intermediate streams, and on the Rio Grande, whence it straggles on into Mexico. Away on the Pecos, nearly 400 miles from the Trinity, it finds its western limit. It runs up the Brazos, Colorado, and their tributaries, to their mountainous head waters, where it has a stunted, spreading form. From Hidalgo, on the Rio Grande, to its northern limits, in Baylor, Archer, and Jack counties, are 500 miles. All that vast territory, 300 by 500 miles, has the Live Oak as one of its most pleasant and distinct characteristics, in all the timber-belts, which are chiefly found along the streams. However, about the center of this great region, comprising the counties of Comal, Kendall, Hays, Blanco, Gillespie, Mason, Llano, Burnet, Lampasas, Brown, Hamilton, Comanche, Taylor, Callahan, Eastland, Erath, Hood, and others, there is a hilly, mountainous, well-watered country, quite generally covered with forest trees, of numerous species besides the Live-Oak. This hilly region promises very favorable to fruit-growing, especially to the stone-fruits and grapes, and the Live-Oak would be an admirable tree of which to form wind breaks, as also would the Cedars, common here.

Sapindus marginatus (Soap Berry, Wild China). Found in bottoms of Northern and Eastern Texas, 20 to 40 feet high. Wood very close-grained and heavy, though little used.

Sassafras officinale. All through timber region of Eastern Texas.

Salix lucida (Shining Willow). South-east Texas.

S. nigra (Black Willow), every-where along streams.

Sophora sericea. Low, moist places along the Rio Grande.

S. speciosa. Valley of the Pecos, hills of Western Texas, Mr. Bonnell, Austin; also on the shores of Matagorda Bay, where it reaches 20 to 30 feet, though elsewhere rather shrubby. A beautiful evergreen, bearing necklace-like pods, which hang on the tree all winter, and till the bloom the next next season comes forth. Introduced into cultivation. Flowers blue, fragrant, pretty.

S. tomentosa ("Beaded Locust"). From the Brazos, northward. Abundant here in Grayson county. Somewhat of the same description as *speciosa*, except the leaves are deciduous. Loves rich soil and shady situations. Much the habit and form of *Virgelia lutea*, and would make a beautiful companion.

Taxodiu distichumm, (Bald or Deciduous Cypress). This noble and valuable tree is found in abundance along the swampy bottom lands of Eastern Texas. In Liberty, Hardin, Tyler, Jasper, and Newton, in the swamps, which must for generations otherwise remain but useless, life-destroying, malarial hot-beds, this grand forest monarch rears aloft his huge, straight, branchless trunk to 75 or 100 feet, standing a blessed offering to the millions of the present and future generations, as splendid material for posts, piles, shingles, water-tanks, and a thousand other valuable uses. It extends up the streams of Eastern Texas, even into Bowie and Red-River counties. It runs well up on the Trinity, Brazos, Colorado, Guadalupe, Nueces, Rio Grande, and many of the smaller intervening streams. Below the town of Carrigo, in Zapata county, opposite the mouth of the Rio Salado, flowing from Mexico, large trees are frequently seen growing in the bed of the Rio Grande, where the water is 16 feet deep (Schott).

Tilia Americana (Linden, Bass-Wood). Chiefly along streams of Eastern Texas, and growing to a large size. Not seen outside of the forest region of Eastern Texas, except in very unsuccessful attempts at cultivation.

Ulmus alata (Winged Elm, Whahoo, Corky-Elm). Abundant along ravines, streams, and in rich, flat, timbered lands of Central and Northern Texas, and more or less every-where in the timber belts of the state. Much used for saddle-trees, but a poor timber otherwise.

U. Americana (American or White Elm). Common along streams in all the East, North, and Central parts of the state, but not reported in the region of the Rio Grande.

U. crassifolia [Nutt. in Trans. Amer. Phil. Soc., *U. opaca*, a prior name by same author in his Sylva], (Cedar Elm, Texas Elm). Extends from the San Antonio river, in South Texas, and Pecos river, West Texas, northward and eastward along the rich limestone bluffs of the larger streams, and in the heads of ravines, and sometimes of large size in dry, rich creek bottoms, all through Central and Northern Texas, and into the Indian Territory to the region of the Canadian river, covering about the same territory with the Osage Orange, except that it runs much further to the South-west than the latter. It does not extend into the dense forest region of East Texas, but reaches its borders. It is a most striking tree, especially in the spring, when its early, dark, glossy, compact foliage contrasts so distinctly with all surrounding green. At a distance it resembles a round-headed Cedar, hence its common name by which it is exclusively known in its native regions. It has the peculiarity of producing seed in October, instead of early spring, like other Elms. It is of slow, rigid growth, the wood white to center, and usually easily split. I have seen specimens 75 feet high and two feet in diameter, though generally from 30 to 50 feet. The wood is not durable when exposed to the weather, but would make fine fork and rake handles.

U. racemosa found in company with Americana, but not so abundant.

Zanthoxylum clavi-Hercules, or Carolinianum (Southern Prickly-Ash, Hercules Club, Angelica Tree, Tear-Blanket, Pepperwood). Found in strong, well drained bottom lands along Red river and the streams of East Texas, sometimes 18 to 24 inches in diameter and 40 to 50 feet high. A tree with so many local names is certain to have some striking peculiarities. It is termed "Tear-Blanket" in Eastern Texas, on account of the spines tearing the clothes of hunters and others who attempt to climb it or pass through a thicket of it. The spines which come upon the young wood never drop off, but a corky protuberance builds up under the spine from one to two inches, thus giving the appearance of "Hercules' Club." The bark and berries are very pungent, and thus comes "Pepperwood." This idea of pungency combined with that of the Ash-shaped leaves, gives "Prickly-Ash." Extract of the berries and bark has proven a good remedy in ague. The wood is strong and durable. The flowers are rich in honey, and the honey made therefrom by bees has the pungent taste of the berries.

The celebrated forest-region of East Texas, so often mentioned in this paper—a country larger than the State of Ohio—is almost one grand, continuous forest of the various species mentioned, and located, as nearly as one can well limit such, as stated in connection with each species. The boundaries of this region lie generally from 20 to 40 miles northward and westward from the western boundary line given for *Pinus tæda*. It is bounded on the south by a belt about 50 miles wide, of flat and more or less swampy prairie—fine for grazing—which extends to the gulf beach. It is bounded on the north by Red river, and on the east by Louisiana and the Sabine river, only as artificial boundaries, as this great forest continues on through the South-east part of the territory, through Arkansas, Louisiana, and the other gulf States. In this region, wherever forests are cut away and lands are not cultivated—as little of it is—young forests, of the same or different species, quickly spring up and are ready with good timber for building purposes in 30 to 50 years.

Acknowledgments.—In justice to myself, being inexperienced in writing on subjects embracing such a multitude of details, and covering so broad and difficult a field, I wish to say, that the time required to do this work was snatched at odd moments from a most busy situation in my nursery affairs, and that correctness in every case is not claimed, neither completeness in number of species, or remarks of importance on many named. An experienced botanist could do valuable work for the state and country at large for years, at dilligent work, in Texas alone.

Only for the kindly aid with facts and generous hospitalities, while making a tour of over a thousand miles through parts of the state to collect the materials for this paper, would it be meagre indeed. I take pleasure in naming the following who especially aided me:

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For amendments, corrections, and suggestions, I am deeply indebted to my friend, Dr. Jno. A. Warder, whose name is now a household word with every horticulturist and forester in the land.

THE ARBOREAL FLORA OF ARKANSAS.

By Prof. F. L. HARVEY, of Fayetteville, Ark.

(Continued from page 424.)

URTICACEAE.

Ulmus alata, Michx.—(Winged Elm.)

Called "Red Elm" in Arkansas, or sometimes "Mountain Elm." Common throughout the State. The branches are not always winged. Attains a diameter of over 2 feet in Arkansas. Quite an ornamental tree. The wood suitable for wagon-timber.

Ulmus Americana, Willd.—(White Elm, River Elm.)

Common in low ground all over the State. A handsome tree for ornamental purposes.

Ulmus crassifolia, Nutt.

Occurs in Southwest and West Arkansas, according to Nuttall. Re-discovered by Mr. Letterman, and also by the writer. This species has the peculiarity of blossoming in the fall. A small tree growing on cliffs and hillsides.

Ulmus fulva, Michx.—(Slippery Elm, sometimes Red Elm.)

Widely distributed in the State, but not plentiful. The bark is used in medicine.

Planera aquatica, Gmelin.—(Planer Tree.)

Common throughout East and Southeast Arkansas in swamps and along streams. Flowers were collected by Mr. Letterman in February. Attains a diameter of one foot in the State.

Celtis Mississippiensis, Bosc.—(Hackberry.)

Occurs througout the low country. Attains a diameter of several feet.

Celtis occidentalis, L.—(Hackberry.)

Common throughout the upland and lowland. Var. *pumila* occurs in Northwest Arkansas. Saw specimens with a stem one inch in diameter and only six feet high full of flowers. The variety has smaller leaves, and blooms two weeks later than the tree form. It may be a good species.

Morus rubra, L.—(Red Mulberry.)

Common in low ground throughout the State. Grows, in favorable situations, four feet in diameter. The fruit is edible and the leaves are used to feed silkworms.

Morus alba, L.—(White Mulberry.)

Is grown quite extensively in the State in yards. A plant of no beauty.

Maclura aurantiaca, Nutt.—(Bois d' Arc, Osage Orange.)

Plentiful in Northwest Arkansas, but apparently introduced. Spontaneous and native in the southwest part of the State. Attains a diameter of two feet. The wood hard and durable. The plant largely used for hedges. The leaves are said to be good food for silkworms.

PLATANACEAE.

Platanus occidentalis, L.—(Sycamore.)

Occurs sparingly throughout Arkansas in the river bottoms, attaining a great size. A conspicuous tree on account of size and the color of the bark.

JUGLANDACEAE.

Juglans cinerea, L.—(Butternut, White Walnut.)

Found only on Crowley's Ridge, in East Arkansas, where it seems to be common enough, attaining a diameter of over two feet. Fruit edible. Wood valuable.

Juglans nigra, L.—(Black Walnut.)

Common throughout the State in rich soil. Grows large and straight in Arkansas. Large quantities have been and are still being shipped. A great deal occurs in the upland in rich valleys, too far from railroads for present use.

Carya olivaeformis, Nutt.—(Pecan.)

Scarce in the up-country, but plentiful in East and South Arkansas. Fruit very fine, commanding a high price.

Carya alba, Nutt.—(White Hickory, Shell-Bark Hickory.)

Common throughout Arkansas, in the up and low country. Fruit edible. Wood highly prized for its strength and durability.

Carya amara, Nutt.—(Bitternut.)

Common in low ground throughout the State. Grows on rich mountain sides in Northwest Arkansas.

Carya aquatica, Nutt.—(Water Hickory.)

Found along streams, and in low ground throughout South and East Arkansas. Sometimes over two feet in diameter.

Carya myristicaeformis, Nutt.—(Nutmeg Hickoy.)

Common in the Red River bottom about Fulton. Also all the way from Pine Bluff to Arkansas City, and doubtless across the State between these points. The species is well named, and Down-East Yankees would have been saved the trouble of manufacturing wooden nutmegs if it had been native in New England instead of Arkansas. Kernel edible, but small. Tree handsome. Foliage conspicuous.

Carya porcina, Nutt.—(Black Hickory.)

This species is quite variable. Occurs in the dry uplands. The most common species of hickory in the up-country.

Carya sulcata, Nutt.—(Thick Shellbark Hickory.)

Occurs in the river bottoms of Arkansas, though not plentifully.

Carya tomentosa, Nutt.—(White-Heart Hickory.)

Called Black Hickory in Arkansas. Grows with *C. porcina* in the uplands, and not distinguished from it by the country people. Both are called *Black Hickory.* The nuts better than those of *C. porcina.*

CUPULIFERAE.

White Oak Group.

Quercus alba, L.—(White Oak.)

Common throughout the State. The most valuable of all our Oaks. Extensively used for crossties, cooperage and wagon-timber. Grows large and straight in Arkansas.

Quercus stellata, Wang.—(Post Oak.)

Throughout the State. Small and scrubby in the hills, but in the river bottoms a fine tree, often several feet in diameter. The wood makes fair lumber. The small trees are used for posts. An inferior wood for fuel, but the trees growing on the hills are much better than those from the river bottoms.

Quercus macrocárpa, Michx.—(Burr Oak.)

Called *Over Cup Oak* in Arkansas by the Southern people, while persons from the North call it *Burr Oak.* In low ground from northwest part of the State to the north tributaries of the Red River. The acorns of this species in Arkansas are much larger than those from Iowa.

Quercus lyrata, Walt.—(Over Cup Oak.)

Not uncommon in the low country of Arkansas. Especially plentiful in the southwest part of the State. The cup in this species is without a fringe, and almost covers the acorn. The leaves are more lobed than in *Q. macrocarpa,* and the acorns smaller. The wood is not as good as that of *Q. alba.*

CHESTNUT OAKS.

Quercus Michauxii, Nutt.—(Called *Cow Oak* in Arkansas.)

Common in the low ground. Attains great size in Southeast Arkansas, where Mr. Letterman and the writer measured a specimen nineteen feet eight inches in circumference. The wood of this species is used for wagon timber. The proprietor of a spoke factory at Duvall's Bluff informed me that it was of superior quality for this purpose.

Quercus bicolor, Willd.—(Swamp White Oak.)

Not uncommon in the low ground. Found on quite high ground in Northwestern Arkansas. A valuable species for economic purposes.

Quercus Muhlenbergii, Engelmann.—(Called *Chinquapin Oak*, *Pin Oak* or sometimes *Rock Oak* in Arkansas.)

Prefers limestone stone. We have used it as a means of tracing the limestone outcrops in this region. Seen as far southwest as Hempstead county. Grows to be two feet in diameter.

Quercus Prinus, L.—(Rock-Chestnut Oak.)

Said by Prof. Lesquereux to occur in the low ground of Arkansas. Though especially and diligently sought for by Mr. Letterman and myself, it has not been re-discovered. The writer considered *Q. Micheauxii* as this species until corrected by Mr. Letterman. As Prof. Lesquereux does not mention *Q. Micheauxii* as occurring in Arkansas, and *Q. prinus* has not been found, it may be that *Q. Michauxii* was taken for it.

BLACK AND RED OAKS.

Quercus Phellos, L.—(Willow Oak.)

Called *Water Oak* or sometimes *Pin Oak* in Arkansas. Plentiful in the low land and the river bottoms of the upland. Attains a diameter of four feet or more. The tree has beautiful foliage. The wood is of but little value for economic purposes.

Quercus imbricaria, Michx.—(Shingle Oak.)

Scarce in Arkansas. Occurs in the northeast part of the State; also, a few specimens have been seen about Fayetteville, in the northwest part. Probably grows sparingly in all the northern counties.

Quercus nigra, L.—(Black Jack Oak.)

A species characteristic of the dry upland. Attains a diameter of two feet. Of no value for lumber, but as a fuel it stands high.

Quercus rubra, L.—(Red Oak.)

Common in the low ground throughout the State. Attains a diameter of eight feet in Southwest Arkansas. The wood is inferior, though somewhat used for lumber and cooperage. The foliage is attractive.

Quercus coccinea, Wang.—(Scarlet Oak.)

Said, by Prof. Lesquereux, to grow with *Q. tinctoria* on rich hillsides. It has escaped our notice. A fine ornamental tree. Wood inferior.

Quercus tinctoria, Bartram.—(Black Oak.)

Found abundantly on rich hillsides in the mountains. Extends as far southwest as explorations have been made. This species is regarded as a variety of *Q. coccinea* by some botanists. The inner bark is yellow, yielding a dye. Rich in tannin. Wood superior to that of the other *Black Oaks*, and used largely for wagon timber and in construction. Considered a good fuel when dry. Attains a diameter of several feet in Arkansas, and is a fine tree.

Quercus aquatica, Nutt.—(Water Oak.)

Throughout the State on the Neozoic, extending up the river bottoms of the Palæozoic. Occurs in the Arkansas river bottom beyond the west boundary of the State. A small tree, apparently related to *Q. nigra.* Of no economic value.

Quercus palustus, Du Roi.—(Pin Oak.)

Called *Water Spanish Oak* in Arkansas. Not distinguished from *Q. rubra* by many people. Common in the low land. Specimens four feet in diameter were seen. Wood coarse grained and inferior. Tree quite ornamental.

Castanea pumila, Mill.—(Chinquapin.)

Common in both the upland and low land. Observed in East, Southeast, Southwest and Northwest Arkansas. This interesting species attains its greatest development upon the Neozoic formations in Hempstead county, Arkansas. Specimens were measured at Washington, Hempstead county, four feet in diameter.

Such giants of the forest ought to be distinguished by a more dignified name than *pumila.*

At an elevation of 1,500 feet, near Fayetteville, in Northwest Arkansas, specimens occur two feet in diameter.

The trunk of this species is short, but it develops a wide-spreading top. The fruit is esteemed, and sells for from four to six dollars per bushel.

Castanea vulgaris, Lam., Var. *Americana,* A. D. C. (Chestnut.)

Though this species is cultivated in Arkansas, we have not been able to gather any evidence by inquiry or observation to make us believe it is indigenous. Mr. Lesquereux says he saw specimens of small size in Arkansas, The species must be scarce west of the Mississippi River.

I find that no reliance can be placed on the statements of unscientific persons about the occurrence of trees. There is no desire to prevaricate, but they do not discriminate closely enough for scientific purposes

Fagus ferruginea, Ait.—(American Beech.)

Found in East Arkansas, on Crowly's Ridge, also on the Neozoic formations of southwest part of the State. There are a few trees in the uplands of North Arkansas, but they were most likely introduced. This species may be regarded as peculiar to the more recent formations of Arkansas. The species seems to be at home, attaining a diameter of three to four feet.

Ostrya Virginica, Willd.—(Hop Hornbeam, Ironwood.)

Rather plentiful along cliffs and hill sides throughout the mountains of the State. The hop-like fruit is quite conspicuous. Wood strong.

Carpinus Caroliniana, Walt.—(Water Beech.)

Throughout the State, getting more common as you go toward the South, where it a tree of considerable size.

BETULACEAE.

Betula nigra, L.—(River Birch.)

Throughout the State along streams. The only species we have seen.

Betula alba, *var. populifolia,* Spach. *Betula populifolia,* Ait.—(White Birch.)

Said by Nuttall to grow on sandstone barrens in Arkansas.

Alnus serrulata, Ait.—(Smooth Alder.)

Attains a diameter of 6 inches in South Arkansas, and has a well developed top and trunk.

SALICACEAE.

Salix nigra, Marsh.—(Black Willow.)

Common along rivers and creeks in both the upland and lowland. In favorable situations attains a diameter of 3 feet or more. Wood of no great value.

Populus heterophylla, L.—(Downy Poplar.)

In river bottoms through the State. Attains a large size.

Populus monilifera, Ait.—(Cotton Wood.)

Found along streams throughout the State. Perhaps more common than the former. *P. balsamifera* and *P. tremuloides* are cultivated.

CONIFERAE.

Juniperus Virginana, L.—(Red Cedar.)

Quite plentiful in the North part of the State. Extends along the mountains to the Red River country.

Considerable is cut in North Arkansas for fence posts and telegraph poles. The trees are cut and flooded down the streams to the railroads.

Taxodium distichum, Richard.—(Cypress.)

Common along streams, and in swamps throughout the low country; also in the river swamps of the Palæozoic.

The source of considerable lumber and shingles.

Pinus mitis, Michx.—(Yellow Pine.)

This species is called Hard Pine, or Short-leaved Pine in Arkansas.

Occurs on the ridges in both the upland and low country. The belts are thin and scattering in the mountains, but South of the Arkansas River the trees get larger, are closer together, and the belts extensive. North of the Arkansas River a great many deciduous trees grow with the pines. The per cent of pine increases as you go South, but there are no forests exclusively pine in the State. There are about 20,000 square miles of pine land, which will yield between 40 and 50 billion feet of lumber. The above estimate does not include trees below 15 inches in diameter, and ignores the fact that in Arkansas pine largely replaces pine, which would insure a continued supply.

There are two or three varieties recognized by the lumbermen, based upon differences in trees growing on dry and wet soil, the amount of resinous matter, etc. The lumber from this species is not very durable when exposed to the weather. The outside of the boards will appear sound when only a thin shell remains.

The time of cutting the trees is said to affect the durability of the lumber. The pine lands of the State are fast passing into the hands of lumbermen, and are doomed, like the Michigan forests, to rapid and wanton destruction.

Pinus inops, Ait.—(Scrub pine.)

Said by Nuttall to grow in Arkansas on sandstone barrens. Has not been re-discovered.

Pinus rigida, Miller.—(Pitch Pine.)

Mentioned in Nuttall's Catalogue of the Plants of Arkansas as occurring on sandstone barrens.

Pinus tæda, L.—(Old-Field Pine.)

Called *Long-Leaved Pine* in Arkansas. Grows with *P. mitis* south of the Arkansas River. A few straggling trees are found north of the river, but practically this stream is its northern limit. It is cut for lumber, and is included in the lumber estimate under *P. mitis.*

This closes our consideration of the Forest Trees; and, that the species may be compared, we give a summary of the orders, genera and species.

TABULATED LIST OF THE FOREST TREES OF ARKANSAS.

Number	ORDERS.	INDIGENOUS.		NATURALIZED OR CULTIVATED.	
		Genera.	Species.	Genera.	Species.
1	Magnoliaceæ	2	4	1	1
2	Anonaceæ	1	1		
3	Tiliaceæ	1	1		
4	Rutaceæ	1	1		
5	Simarubaceæ			1	1
6	Ilexineæ	1	2		
7	Rhamnaceæ	2	2		
8	Celastraceæ	1	1		
9	Sapindaceæ	4	8		
10	Anacardiaceæ	1	3		
11	Leguminosæ	5	6		
12	Rosaceæ	4	17		
13	Hamamelaceæ	2	2		
14	Araliaceæ	1	1		
15	Cornaceæ	2	4		
16	Caprifoliaceæ	1	2		
17	Ericaceæ	4	4		
18	Sapotaceæ	1	2		
19	Ebenaceæ	1	1		
20	Styracaceæ	2	3		
21	Oleaceæ	3	7		
22	Bignoniaceæ	1	2		
23	Lauraceæ	2	2		
24	Urticaceæ	5	10	1	1
25	Platinaceæ	1	1		
26	Juglandaceæ	2	10		
27	Cupuliferæ	5	21		
28	Betulaceæ	2	3		
29	Salicaceæ	2	2	1	2
30	Coniferæ	3	6		
	Total	63	129	4	5

SUMMARY.—Native orders, 29; naturalized orders, 1; Native genera, 63; introduced genera, 4; native species, 129; introduced species, 5.

The Arboreal Flora of Arkansas is remarkable for the number of Forest Trees. For the extensive belts of Pine forest. For the area of Hardwood growth. For the number of species of the orders *Magnoliaceæ*, *Rosaceæ*, *Uticaceæ*, *Oleaceæ*, *Juglandaceæ*, and *Cupuliferæ;* these six orders embracing over half the species of the State. For having all the North American species of *Carya*, which can not, we believe, be said of any other State. For the number of species of *Cratægus*. For the number of species which are usually classed as shrubs, but in Arkansas attain the dimensions of trees. For the occurrence of large individuals of Chinquapin and other species, and for the prevalence of uncommon species. This concludes our consideration of the Forest Trees of Arkansas. We feel keenly that there are still great opportunities for further research. If in this paper one idea has been contributed to a better knowledge of the Flora of the State in which we live, it will be regarded as an adequate compensation for the time and expense of its preparation.

THE PRESERVATION OF FORESTS.

By CASSIUS M. CLAY, of White Hall, Ky.

WHEN I speak of the preservation of forests, I propose to consider the conditions which have surrounded myself, and to give my own experience and observations, rather than any attempt at scientific generalization. When Kentucky was first visited by the white man, it was unbroken forest and prairie. The central parts of the State were covered with the finest trees—among which were the Yellow Poplar or Tulip Tree, Black and White Walnut, Sugar Maple, Coffee-bean, Oaks, Wild Cherry, etc. In places, there were undergrowth, cane, and wild flowers, with wild grape vines in unlimited extent. In the southern or Green river region, prairies were frequent, and the growth mostly Beech and Oaks. Mounds, earth-works, flints, pottery, and other evidences of Indian occupancy in ancient times, existed every-where, but for long centuries it had ceased to be the fixed abode of any tribe; but all the tribes of the contiguous states used it for a common hunting ground. The game was mostly buffaloes, elks, deer, the black bear, wolves, foxes, etc. The rivers were full of fish, and the waters frequented by wild fowls. The wild turkey and pheasants were also found here. The better portions of the State are underlaid with limestone, clay, iron ores, and débris, wafted in primitive times by the flow of northern waters, leaving all the elements of plant-growth in minute particles on high rolling and alluvial grounds. Salt, silica, etc., also abound. Upon such a soil, in this genial clime, with a good annual rain-fall, grew the finest forests, in many respects, in the world.

The early hunters cared for little but game, and the forests began to be cut down to any great extent only when the agricultural class followed the hunters. The method was to find a good spring of lasting water, and there build the log hut. To prevent injury from storms and the falling trees, a "clearing" was generally made, and the house and the cultured fields were in one inclosure. The habit was to girdle the trees, destroy their lives, and, as the limbs and trunks rotted and fell, to burn them, and then cultivate. After awhile, fruit trees were introduced by seeds and stones. The birds, the woodpecker tribe especially, were plenty; bored the dead trees for nests, and lived upon the larvæ of insects, there also nesting themselves. The result was fine fruit of all kinds and unscathed vegetables. When fruit trees began to be later imported, there were brought with them those many insects which infest all vegetable growth; and the birds following the destructive ax of the pioneer westward, and falling under the deadly shot-gun, leave us to an unequal war with the smaller insects, now man's most destructive enemies.

As a wealthier and more refined class of immigrants succeeded the first two classes, frame, brick, stone, and hewed log houses were built, and some trees began to be preserved from the omnivorous ax. Then trees began to be planted in the place of the original ones—mostly Black Locust, Catalpa, the crooked variety, Lombardy Poplars, China-Trees, and all that class of imported stock, all inferior to the first native growth.

My first recollections were of two rows of Lombardies on the two fronts of our early brick house, flanked on the gable views with out-buildings, and scattering Cedars and half-filled lines of Yellow Pines, with occasional native trees, left for their especial size and beauty. The Black Locust also figured along the fence borders; all in military style (?) Outside the cleared fields were dense forests of untouched growth, with fifty feet or more of shafts with arched tops, excluding the sun; and from the fallen leaves sprang many most delicate wild flowers, with here and there clumps of Pawpaws and long snaky grape-vines, reaching to the top of the highest trees. The cattle and sheep ranged in common, feeding upon scant wild grass, shrubs, and limbs of the large growth.

Grasses.—The earliest exotic grass was the English greensward, *Poa pratensis*,* now the celebrated blue-grass of Central Kentucky. It followed civilization, like the honey-bee, westward, and took hold in genial soils, excluding almost all other grasses and weeds. My father was a large land-holder, and rented out much of his land to be tilled by tenants on the shares, raising corn and tobacco; but neither he nor his tenants cut down the outside forests, being confined to fallen trees and limbs for fire-wood. The result was, that only on abandoned farms and clearings did the grass take hold. I well remember how, when a very small boy, I went with the slaves to bring home at night the milk cows from a small grass field, unfenced, a mile off, perhaps, directed by the tinkling of the cow-bell. Now, the reason of this, our honored President will be shocked to hear, was not to influence climate, or to revere nature by preserving these, her greatest works of beauty, but to prevent trespass, and with the hope that, in course of time, the timber would bring a fair price.

Destruction of forests.—As soon as the blue-grass began to be appreciated, the forests began to fall under the ax, and fences made of split rails. I give my own experience. I began by "belting all trees of early decaying wood—Beech, Buckeye, Elms, Dog-wood, Hackberry, etc.—leaving the durable Poplars, Walnuts, Hickories, Oaks, Coffee-beans, etc. These trees were cleaned off as they decayed as the "clearing," and under those left was sowed blue-grass, generally on the snow to suit the time and equal distribution of seed.

I went over twenty-two hundred and fifty acres, including the fields, in this style, cutting briars, weeds, and bushes with scythes, till the grass, fed upon by sheep and cattle, formed a sod. These, then, were lovely parks, not excelled in all the world.

Decay of forests.—Unhappily, these isolated trees began an early decay. The reasons are not far off. The roots of trees

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*Note.—The Mason County, Ky., Historical Society lately said that the *Poa pratensis*, or English grass, was indigenous here: a mistake.—C.

naturally run near the surface of the soil, seeking air, light, and sunshine. The leaves fall, and, unblown by winds, remain winter and summer mulch, protecting them against drought and frost. After thinning, the leaves are insufficient or are blown afar off. Then the stems or shafts, once shielded by the massed tops of trees from the sun and winds, are exposed to both; and, above all, the blue-grass, running near the surface with its matted roots, absorbs moisture and all the elements of growth, and leaves the forests to decay. They begin by dying at the tops, and at last perish by the rotting of the centers. So, the fine trees, which should have lasted centuries, have almost all disappeared in sixty years. Of the native forests, the Black-Walnut, the Coffee-Bean, and the White, Burr, and Chincapin Oaks, are the most durable here.

Happily for me, I left about fifty acres of native forest untouched, and that remains vigorous as in the beginning, when, a hundred years or more ago, it was first seen.

Fruit trees.—The Peach, cleared of the borer and properly trimmed, will live twenty years or more. All the seedling Apple trees have died but one. A hundred-year-old Pear tree, reduced to a shell and almost a stump, was cut away by me with great reluctance this winter. The grafted Apple tree has proved more short-lived than the seedling. None of the Cherries have lived over the century. The Quince has passed away also.

Planted trees seem to be in a way to live long, because the limbs, being left low, kill the grass and weeds, shelter the shafts, and generally adopt habits of durability. Of the planted trees, all survive which have low limbs, as the Walnut, Hickory, Water Maple, and Sugar trees. And, though the Black Locusts failed, it was in part, perhaps, owing to an insect which, of late years, has attacked and eaten up the leaves. Trees planted singly, or in groups, if left with all the branches, bid fair to live as in the original forests.

The re-growth of forests.—In some lands, the pine being cut away, the oak succeeds, and the reverse. I do not propose to discuss the question of the origin of species of plants or animals, or the elementary creation of the same. The Mosaic account I receive as at present advised, but I am always in favor of full discussion and experiment. In other lands, elaborate preparation of soil and seed and culture are needed to grow forests, even where the rainfall or possible irrigation will allow. But here, in all the woodlands, at least, and in most of the cultivated fields, it is only necessary to keep off the stock and the plow, and the original forests will be exactly restored. In the prairies of Southern Kentucky, once bare of trees, by these methods Oak forests have been everywhere grown, till, by such means and culture, the original features of the country are entirely changed. If all the country lying west of the Mississippi river, having a less rain-fall annually than twenty inches, be unfit for farming, it will probably be also unfit for forest culture. The facts should be known and submitted to at once, without further disaster there, proved by melancholy experience. Then, by artesian wells, local waters, and other means, affording life, support to man and beast, the rich and scant foliage of grass and shrubs of part of the year's growth could be utilized by grazing, and winter hay, and crops suited to the rainy seasons, when there are any. Sheep, and Angora and other Asiatic goats, would be well suited to many parts of the Rocky Mountains, where grass and water are found during the year; and where magnificent natural scenery would compensate for the luxuries of more civilized life.

The effect of trees upon health.—Much has been said about the Eucalyptus tree destroying malaria. All trees destroy malaria. The Rev. R. J. Breckenridge bought a place on Elkhorn creek, near Lexington, where the stagnant waters, when low in summer and not shaded, always produce malaria. He told me that he planted Sycamores and shaded the water-holes, and the result was the entire disappearance of autumnal fevers.

Trees and climate.—It has been denied that trees affect the rain-fall or climate. How the sum of the rain-fall is during late years, compared with the old times, I am not prepared to decide. The able papers in this direction given by John R. Proctor and Robert Peter, of the Kentucky Geological Survey, give us ground to say, that, when the rain-fall is annually below twenty inches, successful agriculture need hardly be attempted; and this line of rain-fall covers vast lines west of the Mississippi river, decreasing as you approach the Rocky

Mountains. And when agriculture fails, trees fail also. As at present advised, I would say that, when there are no trees, it is best to stay away. I move in the sphere of experience with more certainty. I remember, when the forests were hardly broken here, that springs of water were very frequent and perennial. The rivulets and creeks and rivers had a perpetual flow; these have now changed. The rivulets and creeks are now dried up in summer, and the fish so often caught by me in earlier years are gone. Not one spring in a thousand remains. Indian corn was generally planted in March, and the rains and exhalations of moisture from the surroundings made crops successful every year. Now, the destruction of the forests has lost us that bed of leaves, which was a perpetual reservoir of water for springs and evaporation; aided by the treading of the hard surface, the rain-fall, if the same as of old, rushes off at once, sweeping the soil into the Mississippi delta. The dry winds absorb not only the ancient humidity of the air, but drink up the subsoil evaporation. So that our winters are longer, more changeable, and unendurable. Corn can hardly be safely planted until late in April, and drouth too often ruins all in spite of our best efforts.

Now trees do influence rain-fall within the limits of forests in a state like Kentucky, where the rain is not precipitated by mountain heights, but by the meeting of warm, moist, and cold winds. Here one neighbor has plenty of rain, and another scarcely any. And, even if the rain-fall should be the same for the whole State, the owners of forests have reason to believe that these wind-breaks are favorable to rain eddies and rain-bearing currents of air. Here is room for future scientific inquiry and experience. One thing I have found out by artificial landscape gardening: that trees, planted many deep towards the south, make the immediate shade-trees nearer the mansion cooler. The reason being that, as most of our air currents and winds come from the south-west, even a few more feet of shade in that direction give very marked coolness against the hot currents of air from a sun-parched surface. And the question, therefore, must be logically put, if a few trees make such marked difference in the temperature, what must the effect of great forests in the same direction upon animal comfort and plant growth?

THE AMERICAN FORESTRY CONGRESS.

IT should be borne in mind that the time for the annual meeting of this Society is approaching, and it should not fail to secure the attendance and active co-operation of every person who feels an interest in the conservation and the restoration of our Forests.

Mr. William Little, the corresponding secretary, having been obliged to visit Europe, resigned this office, and the vacancy has been filled by the appointment of MR. BERNHARD E. FERNOW. He has issued the following circular:

> "The annual meeting of the AMERICAN FORESTRY CONGRESS will be held at St. Paul, Minnesota, commencing on Wednesday, August 8th, 1883.
>
> "The local committee has in charge the arrangement of railroad facilities, etc., announcement of which will be sent to all members in due time, and to all those who express their desire to attend the meeting.
>
> "Papers to be read at the meeting, abstracts of the same, should be sent in to the corresponding secretary two weeks before meeting, according to the by-laws of this Congress."
>
> BERNHARD E. FERNOW,
> SLATINGTON, Pa., July 2nd, 1883. Corresponding Secretary.

Persons not members, and not receiving the circular of the local committee, upon application to MR. J. FLETCHER WILLIAMS, at St. Paul, Minn., will be at once informed concerning the arrangements made. As the American Association for the Advancement of Science, is to meet at Minneapolis (fourteen miles above St. Paul), upon the 15th of August, it is hoped that many persons will find it convenient to attend both meetings.

It is earnestly hoped that the attendance at St. Paul will be large, and that much good will result from the papers that are read, and the discussions that they may awaken.

Persons not members may become so by election, upon the recommendation of two members. The entrance fee is $2, and the annual dues $1. By a resolution adopted at the Montreal meeting in August, of last year, all of those who belonged to the "American Forestry Association," are members of the present organization.

The State of Minnesota was the first to organize a State Forestry Association, and the enthusiasm that has been manifested throughout the prairie regions in Forest Tree-planting, is a sufficient guarantee that nothing will be over-looked that can in any way tend to render the coming meeting both pleasant and profitable. It should be the earnest wish of every member to extend the sphere of usefulness of the Society to the utmost of his ability, and to render the occasion one of unqualified success.

THE BLACK OR YELLOW LOCUST.

By JOHN S. HICKS. of Roslyn, L. I.[1]

THE Locust takes its common name from a resemblance to the ancient Locust, mainly in the form of its leaf—"*Robinia Pseudacacia*," from its being introduced into France by either John Robin, gardener to Henry IV., of France, or his son, Vespasian, about 1601.

All evidence seems to point to Virginia as being the place of its most natural growth.

There are Locust trees on the lawn of Daniel Bogart, at Roslyn, L. I., that were brought by Capt. Sands from Virginia over a hundred years ago. I think there are but two kinds of the Locust generally known: the Black or Yellow Locust, and the White Locust.

The White Locust, the bark of which is much smoother, has more sap wood, and the heart is of a silvery whiteness. It is of little value, either for strength or durability, and I think, as this variety is more easily grown from seed than the Yellow, that it is often planted by mistake for that variety.

The Yellow Locust varies much in different localities and soils, some being darker in color than others; and this fact has also, undoubtedly, given the name of "Green Locust," to a variety of this species. The "Yellow Locust" is the only one of value.

Though it occasionally attains the height of 90 feet, yet beyond 40 or 50 feet, the growth is very slow and unprofitable. It is better to cut them down at that height and plant anew.

The young trees have sharp and strong prickles; but these disappear largely after the tree has a growth of three to four inches in diameter, although the smaller branches always have some. The Locust does very well on yellow sandy soils; and in yellow sand banks, with no alluvial soil covering the sand, it will often grow spontaneously, but in heavy clay soils it often proves a failure. The fact that it will grow profitably upon soil that will not produce pasture, or grow other trees of value, and that after the trees have grown a few years they induce, by their shade and rich falling leaves, a good growth of pasture, makes it, in many places, the most valuable tree that is grown for profit. It thus makes many unsightly spots beautiful, and heavy hill-sides profitable. The roots usually run near the surface of the ground, and extend to a great distance.

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[1] Read at the meeting of the American Forestry Congress held at Cincinnati in April, 1882.

It is now being largely used in reforesting the desolate regions of Austria and Hungary—localities that have been made desolate by the destruction of their former Forests. It thrives well in these countries, growing in 30 years to twelve inches in diameter. It grows well in portions of all the Middle States, the southern parts of the Northern States, and the northern portions of the Southern States.

In some localities attempts were made to introduce its growth; but after the appearance of the borers they abandoned it, although it often survives them, and, sometimes, when cut off after the borers had attacked it, the second growth thrived well.

When dry, the wood weighs fifty-four pounds to the cubic foot, and when green it weighs sixty-two pounds, as shown by tests made at Brest; and, in the Woolwich ship-yards, it was found to be of about twice the strength of British Oak. It is used largely in the making of tree-nails for fastening planks to wooden ships, and for top timbers and beams of vessels in exposed places.

The most important use, however, is for fence posts, and beams of cellars, or sills of exposed buildings. It has been known to last from forty to sixty years as fence posts; and the writer knows of posts not over three inches in diameter that have been in use for thirty years. Houghs' Report on Forestry mentions instances of its lasting fifteen to twenty years as railroad ties, in conditions where the Oak had lasted from five to ten years, and the Chestnut from six to eight years. The timber is used very extensively by carriage builders; and, in some instances, in preference to Hickory. The firm of Brewster & Co., of Broome street, New York City, are using it, and paying higher prices than for Hickory.

The delicacy and lightness of its foliage distinguish this from all other trees in our cultivated woodlands, while the color of its leaves, so different from others, makes its presence known at a long distance. The rugged character of its rough bark, and its singularly, light and graceful foliage, render it a tree of peculiar beauty.

Its leaflets are arranged in opposite pairs along the midstem, somewhat similar to the Mountain Ash.

It is late in coming into leaf, and it sheds its foliage early in autumn; but in the perfection of its verdure no other tree rivals it. The foliage as it decays, becomes very fertilizing to the soil, causing the grass beneath to be always green and luxuriant.

Its white and fragrant flowers appear in May and June. Tradition says the American Indian made the gift of a branch of its flowers a declaration of love.

The nightingale and other small birds resort to the protection of its thorny branches.

On Long Island, near New York City, this tree proves to be the most valuable one that has been grown. When thirty years old they will make posts from ten to twelve feet in length, and from three to five inches in diameter at the small end. Such posts are worth, in the city, at wholesale prices:

When 8 feet long and 4 inches in diameter......48 cents.
" 10 " " 4½ " " ......77 "
" 12 " " 4¾ " " ......95 "

Fencing posts 6½ feet long, and 4 inches in diameter, are worth 28 cents each. The tree will often cut one post that is 10 feet long, one that is 8 feet, and one that is 6½ feet in length, making the total amount $2.48 per tree.

In the most famed localities, and with five to ten years more of growth, the tree will make, say one piece 16 feet long and 36 inches in girth, one piece 12 feet long, with 30 inches girth, and one piece 10 feet long, 25 inches in girth, making the tree worth from $5 to $7 on the basis of 60 cents per cubic foot; it has sold, in the past, as high as $1.50 per cubic foot. As to value in other localities, Dr. Warder states, that he is cutting trees having a growth of 24 years, averaging 12 inches in diameter and 60 feet in height, making eight to ten good fence post seven feet in length, with from six to eight inches face at the top end, the trees standing 400 to the acre.

Mr. Ezra Sherman, of Preston, Ohio, mentions the following results from Locust seed planted in 1830. Three years after sowing, the trees were planted in a grove of 15 acres, and, also, in an avenue of 200 rods. In 1870, two-thirds of these last were cut. They furnished 180 trees, 1500 posts, worth 35 cents each, or $525. The fifteen acres will furnish fencing for the farm of 1500 acres for all time. The pasture, with stakes and poles for fencing, furnished from time to time, will pay as good a rate of interest as the open land would.

Mr. Waldo F. Brown, of Oxford, Ohio, states that the planting of Locust is the best investment a young man can make. He advises that the seeds should be planted in rows—transplanted into rows four feet apart when one year old, and when large enough for fence stakes, and bean poles, three-fourths of them should be cut out, leaving them when five to seven years old, at the distance of eight feet apart. As soon as the trees are out of the way of cattle, blue grass should be sown, as this does not injure the trees, and grows well, the pasture paying interest on the investment after five years.

As the trees send up suckers as well as sprouts from the stumps and roots, the growth is always increasing, and is thicker after each cutting.

In France it is much grown for vine supports, and is sometimes cut every four years, the leaves being used for forage.

In 1826, premiums were offered by the Massachusetts Society for Promotion of Agriculture for the promotion of its growth and the extirpation of the borer.

The New England Farmer states the growth to be 300 to 600 posts to the acre, worth 50 cents each, besides the growth of pasture, and that the government was paying 75 cents per cubic foot at that time.

The New York Cultivator says, 1210 trees will grow to the acre; that trees grown 28 years produce two to four post each, and that trees grown from suckers, or shoots, are not as much inclined to seed, nor do the borers affect them as severely.

Mr. Allen Furnas, of Danville, Indiana, states that he has grown the Black Locust over twenty years, and that he has had very little trouble with the borers; that it grows thriftily, making good fence posts in ten or twelve years, and from three to six posts in eighteen to twenty years. It grows 1000 to the acre, and at eighteen years the trees are worth 75 cents each. The timber will last an average of 35 years, and it grows well on poor soil.

In the years of 1828 to 1838, Joseph Hicks planted, at Westbay, Long Island, on each side of the highway leading through his farm, for about a quarter of a mile, Locust trees about eight to ten feet apart. The trees were gathered from different part of the farm, where they had grown up from the roots of other trees, and being thus grown, they were planted with but little expense. When first planted the tops were cut off, and it was found that they grew much better from this treatment. After thirty years of growth, and at least fifteen years of the most beautiful shade in the heat of summer, and an abundant growth of grass beneath, they were sold for $500 as they stood, and now three trees are growing in the place of one, and as thriftily as the first crop.

It is thus seen, that this tree will grow in the most of our Middle and Western States, and in many sections where it is not now known. In some places where it has once been condemned, the second trial will prove its value, as the borers trouble it in some seasons and not in others. It is worth a thorough trial anywhere. Being among the most valuable of our timber trees for durability, growing on poor soil, where no other tree will thrive, nourishing an abundant growth of grass, and finally, when cut, sending up twice or thrice the number of young trees, what tree can be of more value than this for forest culture?

TREES ON PRAIRIE FARMS—WHERE TO PLANT, AND WHAT TO PLANT.

By PROF. J. L. BUDD, of Ames, Iowa.[1]

DURING the past twenty years, I have given this subject some study, and may be able to give a few useful hints to those who have as yet had little experience.

Our Forestry Annual, sent to all applicants within the state without cost, gives needed suggestions as to best species, modes of propagation,.setting, etc. Assuming all this to be understood, I will offer a few suggestions on the relative position and place for forest trees upon the farm, and the species best adapted to the several positions.

Dwelling, lawn, and garden.—It will need no argument to show that these need protection from wind-sweeps on the west and north. If facing south or east to the public road, the home grounds can be provided easily with these protective belts.

If facing the north, the belt on the west will be effective against the north-west blizzard, if the dwelling is set well back from the road.

If facing the west, the trees may still be planted west and north, if the entrance and view to the public road be changed a few points to the south of west.

In all these cases, the trees planted for protection should not approach nearer than fifteen rods to the building.

In selecting the species for these home belts, some regard should be given to their expression when grown. If the outer rows are planted with hardy Catalpa, Birch, Hackberry, Hard Maple, Ash, and here and there, in the angles and corners, a Sycamore, the variation in shade and contrast will be pleasing.

The inner trees should not be too thickly or regularly planted, and should mainly be Conifers. In most situations on our prairies, Scotch Pine, White pine, Norway Spruce, and White Spruce, are best, on the score of appearance and utility for this situation.

The lawn trees may be few in number of species, and yet make a better appearance than the usual mixture of every thing obtainable. Oak-leaved Mountain Ash, cut-leaved Birch, White Birch, Scotch Alder, Caragana, Dwarf Mountain Pine, and Savin, with here and there a hardy shrub, will be enough to give a pleasing effect, if the position of each tree and plant be made something of a study.

Stock-yards and feeding-lots.—The shelter belts to the west

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[1] **Read at the late meeting of the State Agricultural Society at Des Moines.**

and north of these should be made effective at the earliest possible moment. In the outside rows, the quick-growing trees, such as Cottonwood and Willow, may be planted for partial shelter until the several inner rows of Scotch Pine grow up into walls of living green. Only those who have had experience can have any conception of the real value of the Scotch Pine for the use here indicated. The plants can now be obtained very cheaply, they are easy to transplant, and twelve years of growth, with very moderate care, will make a wind-break that the owner would not part with for one hundred times its real cost. When the outer rows can be spared, they should be cut away, leaving the evergreen barrier alone in its glory.

Orchard and small fruit plats.—These need the shelter on the *south*, for reasons often given in our reports. The valuable neat-growing trees, intermingled, should here find a place, such as Catalpa, Hard Maple, Honey Locust, with the outer rows of Black Cherry, Black Walnut, Butternut, Mulberry, Miner and Desoto Plum, and Juneberry. The orchard should have no shelter west and north, unless removed at least forty rods from the trees.

Crop shelters.—There are many arguments in favor of smaller divisions of our farms. We have also many direct proofs of the oft-stated fact that our field crops, of all kind and character, are more remunerative and certain where protected by judicious tree planting around each moderately sized field. Experience warrants the belief that trees planted ten feet apart around each field will satisfactorily answer as supports to barbed wire, and as barriers to wind-sweep and too rapid evaporation. Many devices have been used for attaching the wire to the trees, the best of which is, probably, that of fastening the wire to fence pickets by the usual staple, then fastening the picket to the tree with a piece of coiled wire, which will expand as the tree makes growth.

In this kind of planting, the adaptation of species to high and low ground should be considered.

On ridges, the Catalpa, Honey Locust, and Hackberry, will look well, and do well. On lower ground, the Black Walnut, Butternut, Green Ash, Box Elder, and White Elm, will look well and do well. On the lowest grounds, the Willow and Scotch Alder will give best satisfaction.

The use of different species in different fields, and even in different parts of the border of each field, gives a diversity of expression, aside from the main idea of adapting species to the varied elevation and character of the ground.

The nuts of the Black Walnut should be planted where wanted, but the other trees named should be grown in the nursery thickly, so as to form a straight stem, before they are set in fence rows.

In practice, these combined fences and crop protectors will cost less in money labor, for a series of years, than the common post and wire fence. Yet a little timely care is requisite. An occasional post will be needed, on which to tighten the wires; the coils will need looking after to prevent serious injury to the trees; an occasional load of straw will be needed to mulch trees not keeping up in growth, etc. But these cares amount to little compared with the first cost of posts, the replacing, in part or in whole, of such posts, etc., and each year the benefit to the crops and stock of the lessened wind-sweep and evaporation will be more apparent.

Main plantation.—With further experience, the now common plan of planting a rectangular block of timber on the highest part of the farm will be abandoned.

All our most valuable timber trees make most rapid and perfect growth on moderately dry bottom lands. Some of our thoughtful planters have given us good examples to follow. In some cases, the plantations have followed the line of natural drainage centers, as noted in the paper recently read before the Fine Stock Breeders Association of Iowa, thus securing rapid growth of timber and a regular supply of stock water. Others have planted blocks on both high and low points on the farm, thus demonstrating in very few years the position now taken, that the lowest lands that would answer for a good crop of corn in a moderately dry season give the most perfect timber growth.

Still others have demonstrated, that bottom lands subject to occasional overflow are more valuable on our interior prairies for timber growing than any other use.

In the timber plantation, for varied farm uses and manufacturing purposes, the few most valuable species should alone be planted. Black Walnut, Butternut, Black Cherry, Honey Locust, Yellow Locust, Green Ash, Hardy Catalpa, and White Poplar, would make a very good list for the average farm. Perhaps two of the species named should have a word in their defense, as they are by no means popular at present among our tree planters. The Yellow Locust is supposed to be subject to the attack of the borers, and Abele, or White poplar, is objected to on account of its tendency to sprouting. In practice, the Locust has been found exempt from damage, where grown intermingled with other timber, and the White Poplar has not been subject to sprouting except in outside rows, which may be planted with non-sprouting species. As few of our people have experience with this Poplar as a grove tree, I will add that, grown quite closely, it runs up straight and tall, and, with judicious thinning as it attains size, it makes saw logs sooner than any valuable tree known to our state. The timber is close-grained, firm, does not warp, and, in Europe, is regarded valuable as finishing lumber. It is so much superior in quality of timber to other soft woods doing well with us, that it merits the attention of our planters.

In putting out the main plantation, and, indeed, in all forest tree planting, I wish to lose no opportunity for mixed tree planting.

Though we are yet young in experience, we already have in the West many examples of the truth of the European teaching that exclusive occupation of ground with any one species will in no case produce satisfactory results. In planting, intermingle all the species named in this connection. The article given in the *Forestry Manual* on mixed planting, by Hon. C. F. Clarkson, should be read twice each year by every one.

The several plantings advised upon one farm may seem a herculean task to undertake, however profitable and desirable they may prove.

In reality, however, the work is rapid and inexpensive, if the trees be mainly grown and the planting be done from year to year, in accordance with a well-defined plan.

With our thousands of well-to-do farmers on our interior prairies, the only question should be, Will it pay? If it is decided that it will pay in dollars and cents—independent of all ideas of home comfort and æsthetic influences, such systematic plantings should be generally undertaken as a business venture.

MISCELLANY.

The "Plains" of Michigan.—Under this title Prof. V. M. Spalding, of Ann Arbor, has published in the March number of the *American Naturalist*, an article of which we will present the leading points.

There exist, in the central and northern parts of the lower peninsular of Michigan, extensive areas—in one instance over a thousand miles in area—within the "pine belt," and according to tradition, once covered with pine forests. They have been over-run time and again by fires, and for agricultural purposes are of very slight account. The principal trees scattered over these "barrens" are the Scrub Pine (*Pinus Banksiana*), with some of the Poplars, and among the Pines, and still more in the opening there is a thin, but widely distributed scattering of Oak-grubs, or the roots of trees that have been kept down by fires, and that sprout and grow to small trees wherever protected. These are chiefly the White and Black Oaks (*Quercus alba* and *Q. tinctonia*), but in some places the Red Oak (*Q. rubra*) is more common. These trees, although they have important uses, seldom grow large in so poor a soil. A few Wild Cherries, Prairie Willows, and some other woody species occur here and there, while Sweet Fern, Brakes, and various shrubs, and trailing or herbaceous plants, are spread over the sands.

After pasing though extensive portions of these "plains," and comparing them by personal observation with the plantations upon a sandy region near Waukegan, Ill. (described on pages 54-58, of this JOURNAL), and pointing out the folly of attempting to cultivate upon these light soils any of our agricultural crops, Prof. Spalding is led to make the following suggestions:

1.—"The species to be particularly recommended for cultivation on the pine barrens of Michigan, are the White Pine, Scotch Pine, European Larch, and Western Catalpa (*C. speciosa*). Every one of these grows rapidly, and produces excellent timber, on land of the most inferior quality, and in regions exposed to great vicissitudes of temperature.

2.—"Many kinds of trees, otherwise valuable, will not thrive under these unfavorable conditions, and it will prove a waste of time and money to plant them. The White Ash and Black Walnut, for example, two of our best timber trees, require a better soil; the Black Cherry will grow, but, like the Oak, will not attain full size on such light sand; and still others, such as the Ailanthus, that has elsewhere proven a useful species for cultivation. is not sufficiently hardy for our higher latitudes.

3.—"To obtain satisfactory results, planting rather than sowing will have to be practiced. Sowing seeds on the burning sands, and leaving them to take care of themselves, results only in failure. Where the land is soft, and can be marked readily by a wagon track, to aid the planters in distributing the trees more rapidly and evenly, their planting can be undertaken at a minimum of expense.

4.—"The trees that have been recomended for cultivation, grow more rapidly, and attain dimensions suitable for use sooner than is generally understood. Specimens of White Pine ten inches or a foot in diameter, that have been planted only twenty-five years, are not uncommon, and there are well authenticated instances of the Catalpa having made an average annual increase of an inch in diameter—trees twenty-five years from planting having attained a diameter of two feet. Still it is to be borne in mind that these are cases of exceptionally vigorous growth, and, at the best, the planting of trees must be considered a wise and liberal policy for the future, and not a source of immediate gain."

He deems the facts sufficient to

justify the conclusion, that it is altogether practicable to clothe these denuded regions again with pine and other timber trees, whenever the owners of the land, whether individuals, railroad companies, or the State, are ready to assume the care and expense of the undertaking.

He urges that the State take the lead, and in order that the means best calculated to secure success may be better understood, he advises the instituting of suitable experiments, under intelligent direction, for the purpose of determining the various questions in practical Forestry that will arise under these conditions.

We deem the points presented in this paper as well considered, and as deserving of the serious attention of all who are concerned. Until determined by experiment, nothing can be predicted with confidence as to the preference of one species over another, not as to the possibility of making any succeed, upon the more barren of these burnt districts, until some fertility has been given to the soil, by the slow process of decay of the humbler kinds of herbaceous growth.

Words of Cheer from Europe.—In a letter received by the editor of this JOURNAL, from Herr Richard Von Steuben, of the Prussian Forest Service, dated May 8th, 1883, he says:

"The great interest which has been taken in the American Forestry Congress, as I have heard from many others, and the sympathy with which the discussions about the forests, their preservation and cultivation are received, lead us to expect that the results of this Congress will be of lasting value to the United States. As soon as your countrymen understand the necessity of a careful treatment of the forests, every thing, I am sure, will be done, to produce great results. The great energy with which the Americans undertake everything that they believe profitable to their country, is my ground for this opinion."

Forest-Protection.—The public ownership and management of forests in Continental Europe, has brought into existence special systems of police regulations for the prevention of trespass or damages, as well in respect to the timber itself, as to the game which the wood lands shelter. For the training of the Forest Guards, to whom this duty is intrusted, special schools have been provided, and careful rules have been prepared for their guidance. The protection and care of game, the adjustment of rights of common usage, and many other subjects come within the notice of these special agents, and require a course of instruction suited to these requirements.

The proprietary rights in woodlands being with us exactly the same as with other property, these details, and the jurisprudence arising under their forest codes and common rights, have no practical interest with us, and never can have. The codes and manuals relating to this branch of Forestry, and which are neither few nor brief, have therefore no interest to us, further than as they may, in some cases, present methods of management.

We have the same laws for the forests as for the fields, and the ownership of the land implies absolute possession of all the rights pertaining to them, excepting as to the right of eminent domain, under which private property may be taken for a public use, a payment of the full value being made.

To this extent, therefore, American Forestry is simplified. It is, in fact, limited to scientific and practical questions relating to cultivation, management, the prevention of injuries, and the methods for securing the best results at the least expense.

Arbor Day in Nebraska.—We received a copy of the proclamation of Governor Dawes, some days before the appointed day, but as the JOURNAL for April had been made up, we could not notice the subject in time for appearance until after the occasion had passed. The proclamation will still be found to possess a permanent interest, from the statements that it presents, and for this reason we give it a place at this time:

EXECUTIVE OFFICE, Lincoln, Neb.,
March 30th, 1883.

To the People of Nebraska:

The subject of Forestry, or Tree Planting, is fast becoming one of National importance, and is receiving the careful attention of thoughtful minds throughout our own country and in other lands as well.

The steady and rapid disappearance of our forests is viewed with apprehension. We are forced to consider the matter of future demand and supply, and, in view of the facts, it becomes a question of grave moment. The disappearance of the natural growth of timber has been followed in many of our States by the drying up of springs and brooks, a decreased annual rain-fall, and consequent increased frequency of seasons of extreme drouth. The presence of trees and forests exert a direct and controlling influence upon the moisture of the air, and amount of rain-fall, as well as serving to lessen the extremes of temperature, and greatly modifying the severity of climate and season.

The attention of the General Government has been directed to this matter, and it has received substantial recognition at the hands of our National Congress, in the passage of what is known as the "Timber Culture Act," which has for its object the securing of timber upon our treeless prairies.

Encouragement and incentive in the matter of tree-planting is given by the Constitution of Nebraska: which says: "The Legislature may provide that the increased value of lands, by reason of live fences, fruit and forest trees grown and cultivated thereon, shall not be taken into account in the assessment thereof."

The State Board of Agriculture offers liberal premiums for the greatest number of trees planted during the month of April, 1883, by any one person, and for the greatest number planted, or put out during the year 1883. In addition to this, they offer a special premium—known as "Arbor Day" premium—for the greatest number of trees planted upon a given day—divided and classified as to varieties—and earnestly inviting competition thereto from all.

The question of Tree Culture—important as it is to the country at large—is of paramount importance to our State.

Nebraska embraces within her limits lands that are unsurpassed in fertility, and offering, as they do, advantages in the way of easy and simple cultivation, they are being developed with a rapidity that is nearly if not quite without precedent.

Therefore to the end that the past gratifying degree of development and improvement may be maintained, and if possible increased, I, James W. Dawes, Governor of the State of Nebraska, hereby name Wednesday, the 18th day of April, A. D. 1883, to be observed as

"ARBOR DAY."

Embracing in its design results so varied, beneficial and far-reaching, having for its aim and purpose the common interest and general welfare of our State, it should be strictly observed by all classes.

Having reference to both ornamentation and usefulness, to beauty and utility, considering the claims of present enjoyment, and ultimate profitable investment, care should be exercised, and selections for planting made, from such varieties as have been approved by the tests of time and experiment, as suited to the conditions of our soil and climate.

Let it be remembered, that the person who plants, and causes to grow—if but a single tree, shrub or vine—is contributing his or her mite in the way of added inducement and attraction, tending toward that fuller development, and ultimate standing of Nebraska, for which we are all laboring and hoping, and which will surely come.

Done at Lincoln, the 30th day of March, A. D. 1883, in the Seventeenth year of the State and of the Independence of the United States the One Hundred and Seventh.

By the Governor: JAMES W. DAWES.
EDWARD P. ROGGEN,
[Seal.] Secretary of State.

The Effects of Forest Fires.—The April number of *The Indian Forester*, in noticing the Forest Progress Report for British Burmah for 1881–2, gives the following account of the consequences of frequent fires:

"The first consequences of these constantly recurring fires are bamboo forests with standard trees in the hills, and kaing-grass savannahs in the plains. The cover of dead leaves on the ground is annually consumed, and humus is formed.

"The rain-storing power of the forest is lost, and the bare friable soil is washed down into the streams. Wherever a small flat stone, a piece of wood, or some obstacle protects the ground, this forms after the rains the roof of a little mud-pillar, the soil around it having been washed away and carried down by the streams, is doubtless one of the main causes of their rapid silting up. This erosion does not take place in areas which have been successful y fire-protected for some years, and the streams in fire-protected forests become more and more perrennial."

The Scotch Pine.—This is the pine of northern Europe and of Asia, and it is thought that more trees of this species (*Pinus sylvestris*) are living, than of any other tree that grows. Under favorable conditions its growth is very rapid—and, even upon the most unpromising soils, it often does better than any other tree that could be planted. It thrives in the most rugged and rocky soil, and prefers a northern to a southern exposure, and a cool climate. In a recent visit to Cape Cod, where plantations of the Pitch-Pine (*P. rigida*), have in former years been made to the extent of some ten thousand acres, we found that success has been prevented, and operations have been checked, by two unfavorable causes. One of these, and the more important one, is the risk of injury from fires—the other is that from injury from insects. After the growth of the shoots has been well formed, but before it has hardened, an insect deposits its eggs in the young and still herbaceous wood, and the lava working upward toward the tip, along the pitts, effectually kills the twig in which they are lodged. The leading shoot being thus destroyed, one of the side branches may, in a year or two, take an upward growth, and the tree will continue to gain in height, but with a crook in the place where the injury occurred, the time of which might readily be ascertained by counting the rings of annual growth. But often the whole tree is injured beyond recovery, and dies at once, or it may become so scrubby and stunted that it is good for nothing, and presently decays. The Scotch Pine has been tried to some extent in this region, and with the most encouraging success. It takes a more vigorous growth, and in a few years looks down upon its less thrifty neighbors of equal age. Although it appears to be liable to the attack of the insect, and perhaps to an equal extent, its vigorous growth enables it to recover sooner—or perhaps its time of growth is a little later than that when the insect appears. But from whatever cause it may be, these trees have not suffered much, while around them the native Pitch-Pine shows the effects of the injury in a marked degree. The trees bear seeds abundantly, and, when fairly introduced, there is every reason to expect that they will prove to be the most successful tree that has yet been tried in that part of the country, and much superior to any of the native specie.

Results of Cultivation of the Picea grandis, in Great Britain.—It is well known that most of the conifers of the Pacific coast, fail when planted in the Atlantic States. In some cases they do better, when tried in Europe, under conditions that present fewer differences in climate, and, in a few cases, they promise great success. The great California Silver Fir (*Picea grandis*), a native of Northern California, Washington Territory and British Columbia, was discovered by Dr. Douglas in 1830, and the first seeds were sent to England the next year; but it did not come to be very generally known in ornamental plantations, until many years afterward, as the quantity of seeds sent by its discoverer was small, and many of them failed to germinate.

From a Prize Essay by Mr. Robert Hutchison, of Carlowice, published in the Transactions of the Highland and Agricultural Society for 1883, we learn that it has been reasonably successful in Great Britain, the largest, because the oldest, specimens being found in the southern part, and now fifty feet in height. It finds its proper element in loamy or alluvial deposits, and in valleys more or less sheltered, although in various places it thrives upon the hills. The soil and climate of Ireland appear to be admirably adapted to its growth, and several noble examples are reported. The data are, however, as yet, not sufficient to determine as to its probable value as a timber tree. In the few cases that had been afforded for judging of the quality of the wood, it was found to be hard and coarse grained; but these defects might disappear with age, and are a common fault in wood of rapid growth, until matured by time. In ornamental plantations it affords a most desirable addition to the list of trees available for cultivation, and it will grow in favor the more it becomes known.

Thorough Cultivation the Secret of Success in Planting upon the Western Plains.—Mr. C. L. Myers, in a letter to the editor of this JOURNAL, in writing from Ellsworth, Kansas, June 13th, 1883, says:

"Your 'Forestry Journal' for June. contains the best article on growing Forest trees in the West (or any where else for that matter) that I have ever seen in print It tells the whole story. I refer to 'Facts about Forestry,' by the late Leonard B. Hodges, of St. Paul, Minn.

"What he says about the preparation of the soil, and after culture, is pre-eminently to the point. He tells it all, it is practical and true, and leaves nothing for the inexperienced planter to guess at, except the selection of varieties adapted to the particular locality in which the planter resides. Thorough cultivation here, 'away out West on the plains,' will keep forest trees growing thriftly through weeks of hot winds when nothing else will.

"I have raised Honey Locust, Black or Yellow Locust, White and Russian Mulberry, Teás Hybrid, common and Speciosa Catalpa, Box Elder, Soft Maple, Kentucky Coffee Tree, Green and White Ash, here, more or less, for four years, from seed. I have grown them on high, sandy uplands, also on low bottom lands, exposed to every 'Kansas zephur' that visits us in the late summer and early fall months, without their losing a leaf, when almost all trees in the same locality not cultivated or mulched were burned up by the hot winds that visit us invariably at this season.

"If that part of the late Mr. Hodges' article which relates to the preparation of the soil, and after culture, could be placed in the hands of every tree planter in Central and Western Kansas and heeded, it would be worth millions of dollars to our people in twenty years.

"It is of much more importance than the selection of kinds, yet the latter *is* important—but all hardy varieties will grow with this *thorough cultivation.* From my four years observation and experience here (Central Kansas), I would select, especially for the bottoms and uplands, Honey Locust, '*Speciosa*,' Teâs Hybrid Catalpas, and all the Mulberries, in preference to the varieties named in Mr. Hodges article. These trees stand drouth better, are hardy here, are more valuable for farm and railroad purposes when grown, and less liable to the attack of borers than Box Elder, Hackberry and Cottonwood. I did not commence this article to instruct any one in tree planting, but only to heartily indorse your communication from Mr. Hodges' pen."

The Eucalyptus and its evaporating power.—In a Parliamentary Paper, relating to Natal (1878–9, vol. 50, p. 8), we find the following statement:

"Clumps of Eucalyptus planted in undrained swamp lands, at elevations up to 4,000 feet, have been known to completely dry up the space within reach of their roots. The growth of timber in these situations is computed at twelve tons per acre per annum, while the annual growth of the vegetation which it superceded did not exceed one and a half tons per acre per annum."

BIBLIOGRAPHICAL NOTICES.

A General Catalogue of the Flora of Vermont by GEORGE H. PERKINS, Ph. D., Prof. of Nat. Hist. in the University of Vermont, Montpelier, Vt., 1882, p. 49.

This classified list of the flowering plants and three orders of the Cryptogamic plants of Vermont, is the first that has been published since 1842. It gives simply the scientific and common names, with occasional remarks concerning habitat, and relative abundance. It is reprinted from the Vermont Agricultural Report of 1882.

Forest Fires.—By Prof. C. S. SARGENT. Boston, 1883. 8vo. p. 12.

This article is reprinted from the 30th report of the Mass. Board of Agriculture, and is devoted to a general discussion of the subject of forest fires very justly regarded as one of the most serious questions with which we have to deal, in the management of our forests with the view of maintenance and reproduction, for present use and future supply.

The census returns of 1880 showed that 13,899 acres of woodland had been burnt over within the year, at a loss of over $100,000; and in Pennsylvania the area was reported at 685,738 acres, and the loss at over $3,000. These statements are doubtless below the actual amount. In all such calculations, the damage to young trees of no present value is overlooked—but their destruction which is sure to result, is a dead loss of so much time in the growth of a new forest, even where no injury has been done to the soil. This point has been noticed in the article before us, and the slow restoration by natural growth is described in the case of a White Pine forest destroyed by fire. The time estimated for complete restoration by spontaneous agencies in New England is estimated at from 50 to 100 years; but in regions where the rainfall is less certain, a permanent aridity may result, rendering the future growth of trees quite impossible.

The urgent need, in regard to the prevention of forest fires, is a strong public sentiment against the careless setting of fires, and habitual caution in the use of fires. Much may be done by legislation, in this, but not in advance of public sentiment. There is nothing that will tend more toward this than the rapidly increasing value of woodlands, and of forest products, which will tend to present this fact more forcibly every year.

The act of the Massachusetts Legislature passed in 1882, and noticed on page 191 of this Journal, is regarded by Prof. Sargent as defective, but as indicating, at least, a feeling that the woodlands in Massachusetts need protection against fires. He regards the law as not comprehensive enough, and not severe enough. With the growth of opinion, as the importance of the subject becomes better understood, we shall be better qualified to meet the difficulties involved.

Manual del Cultivo del Eucalipto gigantesco y de su superioridad para el asbolado la Aigieve y Carpinteria. Por D. Balbino Cortes y Movales, Madrid, 1883, p. 56.

This little manual on the history, cultivation and uses of the *Eucalyptus*, forms an interesting contribution to the literature of this interesting genus.

The first *Eucalyptus* trees, in Spain, were planted in 1863, in the province of Santander, by D. Marcelino S. de Santuola; and the first memoir upon the subject was presented by him to the commission having charge of an exposition in the capital of that province, November 8, 1866. He had received a plant of the *E. globulus* from Hyerés about 2.2 feet high, which, planted April 14, 1863, had grown to the height of 30 feet in the first two seasons.

The seed catalogue of the Botanical Garden, at Madrid, contains the names of 51 species, but in Spain, as in Southern France, the *E. globulus* has, from the rapidity of its growth, been the favorite tree. Its susceptibility to the frost, however, appears to limit its successful growth to the warmer and more favored region along the southern coast. The *E. amygdalina* had proved more hardy, and could be cultivated further north.

Manual de Podas é Ingertos de Arboles Frutales y Forestales, Por D. Ramon Jordana y Morera. Madrid, 1883. 12mo. p. 232.

This little manual on the Pruning and Grafting of Fruit and Forest trees, forms one of a series of popular illustrated handbooks, of which some sixty are published, at a price ranging from 30 to 40 cents, singly, or at two-thirds of this rate for the whole. The author formerly in service on the Philippine Islands, is a brother of D. José Jordana, mentioned in a previous number of this Journal.

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COPSE CULTURE.

BY DR. A. EBY, SEBRINGVILLE, ONT.

OF the various methods of Forest-culture, there is perhaps none so suited to the immediate wants of this continent, and especially so of the prairie sections of the Western States and provinces, as the Copse, the "Niederwald" of the German foresters. The peculiarities of this system are that the trees are cut while they are yet small, and allowed to reproduce themselves by sprouts from the stump. In this way a regular succession of crops may be obtained in a comparatively few years. While it takes from 80 to 120 years for most trees to attain a state of maturity, it has been observed that their period of greatest growth is within the first fifty or sixty years of their existence. From the fact that trees will grow more thickly while they are yet small and do not yet need such a large leaf-surface, more actual increase of bulk can be attained by the copse system than by any other mode of culture. The ease of reproduction also is greatly in its favor. The sprouts start with an abundance of roots and rootlets already provided, and its growths will be thrown into the production and storage of new woody fibers. As most trees only throw out vigorous and healthy sprouts within the first forty or fifty years of their age, it is necessary that the period of the harvest shall be placed within such a time as will leave the stumps still vigorous and capable of sending forth an abundance of sprouts, while at the same time the plants will have had time to produce and store away the largest possible amount of woody fibre, say from the 25th to the 30th year of their growth.

The reader will easily comprehend that as the trees are cut while they are still small, their product will not be useful as building material, but they will yield a larger amount of excellent fuel than can otherwise be obtained from the same space. The trees can also be used for a variety of useful purposes, such as rails, stakes, hop-poles, scaffolding, hoops, rafters, etc. The influence of the copse on the climate will, of course, be as beneficial as that of an equal area of larger trees. It needs less care and attention, and requires less scientific knowledge for its successful management than is indispensable in the other systems of Forest-culture.

As not all trees will send up sprouts from their stumps, or will do so after repeated cutting, the first question to consider in the planting of a copse will be, "what tree or trees to select?" Where it is desired to convert an existing mixed wood into a copse, the question will be, "what trees will sprout, and will their wood be sufficiently valuable to make its growth desirable?" I shall presently return to this part of the subject. In starting a new plantation, the first question will be to select such trees as will send up vigorous sprouts from their stumps, and, if possible, will do so after repeated cutting, while at the same time they yield the largest amount and most valuable wood for the purpose for which it is intended. Should the object for which the wood is required be a special economic purpose, such a tree must be selected as will be most suitable for the purpose intended, even though it might be inferior in other respects. The Poplar, so extensively used for paper making, and the Willow for charcoal in making powder, are both so easily reproduced that, even should the stumps fail to produce sprouts, there will be no difficulty in keeping the copse always close and producing a full crop.

Hartig says: "Among all kinds of wood none is so well adapted for copse-culture (Niederwaldwirthschaft) as the Oak, which is also so valuable in high-forest culture (Hochwaldwirthschaft), as a copse on Oak stock can be managed several centuries without danger of the stumps dying, and with copious sprouts after each cutting. The sprouts grow up rapidly, and produce not only excellent wood for fuel and charcoal, but the best of tan-barks." As the most of our native Oaks are not inferior in the good qualities mentioned above to those of the continent of Europe, there is every reason to expect equally good results from them. The Hon. Mr. Joly, of Quebec, who has had considerable experience as a tree-grower, speaks very highly of the White Oak (*Quercus alba*) as a rapid grower. Some of the other varieties are equally valuable, and as the Oaks are found extensively in Canada and the United States, there need be very little difficulty in getting suitable stocks. As a rule I would say, select the variety that is indigenous to the district in which the plantation is to be made. Where there are several varieties to be found, that one should be selected that gives the most valuable wood for the purpose for which it is intended to be used.

The Chestnut also gives excellent sprouts from stumps. It grows very rapidly, and its wood is highly valued for many purposes, though probably inferior to Oak as fuel. I have seen it treated in this way in Pennsylvania, where it is largely used as rails for fencing purposes. As the Chestnut is rather particular as to soil and climate, its general adoption for copse-culture will be out of question. Another peculiarly American tree that will thrive in a copse is the Locust. It will flourish in soils so light that the Oak would not succeed; but it is more particular as to climate, and is so subject to extensive destruction by the borer that the preference should be given to the Oak, where it is at all questionable whether the Locust will succeed.

The Beech can also be treated in this way while young; but as the stumps die out after several cuttings and, constant attention is required to renew the stocks, and as its wood is worth very little, except as fuel, it would hardly be advisable to select it for general culture, though it might do very well in special cases.

The Maples, Ashes, and Elms, either alone or mixed together, can also be very successfully treated in this way. If not cut at too early a period, they will produce seeds abundantly, which will sprout and thus keep the copse close, even if some of the older stumps should die out. The maple will yield excellent fuel while the Ash and the Elms can be used, even while small, for very many economic purposes. As they grow very well together, and as they serve so many purposes, it would doubtless be advisable to cultivate them together.

Where the object is to sell the timber, rather than use it for home consumption, the Hickory, with a suitable climate and soil, will prove highly valuable for treatment in this way. Though I can not find any authority for the statement that it will sprout from the stump, I have little doubt that it will do so, and that it will prove valuable for copse-culture.

There are doubtless other kinds of trees that can be treated in this way, but those mentioned will give ample scope for selection. I can not say whether the Catalpa and the Mulberry would prove successful for copse culture, or whether their timber so grown would be valuable. That question will probably have to be decided by future experience.

After selecting the kind of tree to be planted, the next question to be decided will be, what extent of ground is to be devoted to Forest-culture, and what period of rotation is to be adopted. Here let me remark that, in Forestry, success will depend, in a large measure, on the establishment at the begining of a system of rotation, and the faithful carrying out of that system. A want of system will be attended with serious loss, sooner or later. As the harvest is remote, it would be useless to plant a forest and have it rooted up again in ten or fifteen years. There are few trees that grow sufficiently rapid to be harvested in the lifetime of the party that plants them, yet they are all the time increasing in value.

Having decided to devote, say ten acres, to Forest-culture, and a rotation of twenty-five years, we divide 10 by 25 and find that the area to be planted each year is two-fifths of an acre, or 64 rods, equal to a piece of ground eight rods long and eight rods wide. Or let us suppose that the term of rotation is fixed at thirty years—a period which, unless the soil is very poor, and the climate very rigid, will give us about the maximum yield under copse-culture—and the area to be planted is fixed at fifteen acres. This would give us one-half of an acre to be planted each year, until the whole surface is planted with the wood selected, after which, if a proper selection has been made, and with judicious management, half an acre can be harvested each year. This would give an ample supply of fuel for all farm purposes, and give the owner a larger return than if he had his fifteen acres under pasturage. By devoting the labor he would have to put on this field, if under cultivation, to the rest of his farm, he would have so much the better crops that he would not miss the withdrawal of his tree-field, while it, too, would bring him an ample harvest, in return for the little care and attention it will require after it is once planted.

Having now decided on the kind of tree to be planted, the term of rotation to be adopted, the area to be devoted to Forest-culture, and, consequently, the extent of the annual plantation, our next question is the seed—taking for granted that no desirable trees exist, and that it is necessary to commence with the seed. The nuts or seeds should be gathered as soon as they are ripe, and, if possible, nature should be followed and the seeds planted as soon as they are ripe. The Soft Maples, the Ashes, and the Elms, ripen their seeds in June, when they should be gathered and planted at once. They will soon sprout, and form quite large plants by the fall. The Oaks, Beech, Chestnut, Hickory, etc., ripen their fruit in the fall, and the nuts should be planted as soon as possible, as it is difficult to preserve them until the following spring. The seeds of the Hard Maple (*Acer saccharinum*) can be preserved in moist sand until the spring, if it is desirable to do so.

The land should, if possible, be well plowed and finely harrowed before being seeded. If possible, all grass and weeds should be destroyed before seeding, so that the weeds will not get the start of the young plants. If the surface to be planted is rocky, or so hilly that it can not be cultivated with the plow, it will be necessary to provide a nidus for the seeds with the hoe or spade. This will necessarily increase the cost of planting, but it enables the owner to raise a valuable crop from what would otherwise be an almost worthless soil. And even if the cost of seeding is greatly increased, the total investment will be less than where good arable land is used. The increased cost of seeding, will be more than compensated by the smaller value of the land planted. This is a question of great importance in Forestry. The harvest will be valuable when it comes, but as it takes so long a time for the crop to grow it is necessary to use the utmost economy in planting, soil, etc., consistent with efficiency, in order to make the investment pay. Calculations have been made by learned professors of the great profits to be made by growing trees, but I am afraid they did not rectify their calculations by experience. It is certainly profitable to grow trees, but the profits are, in a great measure, indirect and at best not so large as to warrant any extravagance in the original investment in land to be planted or expense in planting. The compound interest on even a small sum, if allowed to run for several successive decades, will amount to quite a respectable sum. But let us return to our subject.

If Oak-nuts are to be planted, they may be sown broadcast about 450 pounds to the acre, and covered about two or three inches with the plow. Should it be desired to plant them in drills, then those should be made about four feet apart, and two nuts planted close together every two feet. Nuts may be planted in a hard soil by means of a spear-shaped instrument about three or four inches long, attached to a handle sufficiently long for a man to use with ease. With this instrument, holes are made into the ground into which the nuts are dropped and lightly covered by pressing the earth together over them. Where the planting has to be done with the hoe or spade, it is best to do so as far as possible in drills at the distance above named. A nidus three or four inches deep, and from six to ten inches in length and width, must be made at each place where a tree is to grow and at least two nuts planted into each bed.

Beech and Hickory nuts must not be covered over an inch or two at the most. Otherwise they can be planted in the same way as the Oak. It will require about 125 pounds to broadcast an acre with Beech nuts.

The advantage of planting in drills will be, that it will take less seed, and then the space between the drills can be planted with corn or a root crop, and thus the land can be utilized until the plants are so large as to require the whole space for themselves. In Germany, rye is often sown with the Oak nuts; but such a practice would not be admissible in this country where the harvesting is done by reapers, instead of the sickle as is the case in Europe.

The seeds of the Maples, Ash, and Elms, must be covered very lightly, not over half an inch at the most. This can be done by drawing a heavy bunch of brush over them, or by dragging them with a light harrow reversed. It requires about 90 pounds of Maple seed to the acre, about 50 pounds of Ash, and 24 pounds of Elm seeds. When it is desired to grow those trees together, about one-third of each of the above quantities of seed may be used.

Where it is intended to stock the copse with Poplar, Willow, or some other easily growing tree, it can be done more easily by planting cuttings and even larger branches. By means of a pointed instrument, holes ten or twelve inches deep can be punched into the ground, into which the cuttings are placed and fastened by the foot. This work should be done as early in the spring as it is possible to do it, after the frost comes out of the ground.

Except in case of very easily growing trees, it is safer to plant the seeds directly to the place to be occupied by the trees. By transplanting, many trees are so much checked in their growth, that it is better to sow the seeds at once to the place where the trees are to grow. This is especially the case with the nut-bearing trees.

My readers need hardly be told that, to attain success in copse-culture, it must be carefully protected against cattle until the trees have grown so large that they can not be injured by cattle eating off the leaves and tender branches. Trees once injured by cattle or deer, will seldom recover their vigor. They will be overshaded by the other trees and remain stunted in their growth.

Instead of growing trees from the seed, it may be desirable to convert already existing woods into a copse. Where such can be done, it is much to be preferred to growing new trees, as the sprouts from stumps will grow much faster than the seedlings. At least three or four years time can be gained, where it is possible to utilize an existing wood for conversion into a copse. This can in many cases be done with very little trouble. The first points to consider when undertaking the conversion of an existing wood into a copse, is the probability of the existing trees sending out abundant and vigorous sprouts, and are the trees of such kinds that it may be desirable to continue their cultivation? Are they still sufficiently young to send out vigorous sprouts? Do they stand sufficiently close to each other to form a close and compact growth?

These points being satisfactorily decided, the next step is to cut off the existing growth. This should be done in the latter part of the winter, or early spring. Care should, however, be used to have all the wood, branches, and brush, carefully removed before the new growth begins, so as to prevent injury to the sprouts. Care must also be taken not to burn the brush in the copse, as the heat would destroy the stumps or any seeds that may have fallen to the ground. Where it is possible to do so, it is better to remove the wood with a sleigh while the snow is still on the ground, as less injury is thus done to the stumps and seeds, than will be the case when the products are removed by a wagon.

The trees should be cut as closely to the ground as it is possible to cut them. Great care should be used that the bark is not loosened from the stumps, or bruised around the edge. Where the roots run along the surface of the ground for some distance from the stumps, it may be well to cut wounds into them. Roots will not send forth sprouts unless wounded. The sprouts are produced at the junction of the bark and the wood. Where the trees are far apart, some of the larger roots may be wounded in order to gain additional sprouts. It will not be necessary to cut the roots through as thereby a certain amount of sap would be cut off from the parent stump, which requires all the nourishment it can get; but a slight wound is sufficient, as may be seen by the sprouts sent forth from roots that have been abraded by a wagon, etc., passing over them. In this way the number of sprouts can be largely increased.

Where the wood to be converted into a copse contains a large number of small trees, it may become a question whether it would not be better to let them remain until the first harvest of the copse is to be cut. Where such young trees have not been stunted in their growth by the overtopping trees, but appear vigorous and are straight and clean, they should be preserved when it can be done without injuring them by the falling of the large trees near them. They will continue to grow and will not injure the growth of the new wood under them, as the shadow they cast will seldom be sufficient to injure the undergrowth.

Most native woods that I have examined, have too small a number of trees, or they are of too great an age to produce vigorous sprouts sufficiently to form a close copse. In such cases we have to resort to the growth of new trees to take the place of those that are too old to sprout, or fill up the vacant spaces between the trees. Where, on the examination of a native wood, such would be considered necessary, steps should be taken to seed the vacant spaces before the removal of the old trees. If the wood contains the desired kinds of trees, it will be necessary to postpone the cutting of the old trees until they produce a good crop of seeds. Steps should then be taken to prepare the vacant spaces for the reception of the seeds. If they are overgrown with grass or moss, such must be removed and the ground left bare for the seed. If thickly covered with old leaves, they should be raked off. When the seeds are fallen, care should be taken that they receive a sufficient covering of leaves. If the leaves on the trees are not enough to cover the seeds, others should be provided in sufficient quantity to protect them. Having obtained a good supply of seeds, the old trees must be removed in the following winter, so as to enable the seedlings to grow. In case of the Beech, and a few other that require shelter while young, it will be necessary to leave a sufficient number of the old trees standing to afford a moderate amount of shelter to the seedlings for the first three or four years, when the old trees should be carefully removed.

If the necessary seed to seed the vacant places can not be obtained in the wood itself within a reasonable time, it should be got in some other places, and artificial seeding must be resorted to in order to get the vacant places properly seeded. It will seldom be found advisable to fill up the vacant spaces by planting young trees in them. In most cases such a procedure would be found too expensive to be found available, and then the growth of the planted trees would be apt to be so stunted as hardly to keep up with the growth of the sprouts from the stumps.

Should the wood to be converted into a copse contain any trees that it is not desired to propagate, it will be necessary to raze them from the root and thus leave the ground in a state fit for the reception of the seeds of such kinds as it is desired to substitute for them. It will be better to remove the stumps, even with some labor and trouble, than to let them rot, which would cause a continual source of danger for fire to spread from. The copse should be kept as free as possible from decaying wood and dry sticks.

Before leaving this part of my subject, allow me once more to impress the necessity of system and order on the forester. If it is desired to convert an existing wood into a copse, it should, if possible, be divided into as many sections as it is intended that years should be permitted for the copse to grow before being cut. One of those sections should be taken in hand each year and cut down. Thus, by spreading the work of conversion over a series of years the farmer, who is in most cases the proprietor, will be able to attend personally to the work of cutting and re-seeding when such is required. In this way the cost of management will be reduced to a minimum, and the proprietor will have the assurance of having the work properly done. The owner will also keep up his supply of fuel and timber until such a time as he can make use of the first planting of his copse. By a little care and foresight, a rich supply of fuel can thus be provided for the use of succeeding generations. As it takes years to grow trees, it will be necessary for the successive owners of woodlands to take up and carry forward, as far as possible, the work of their predecessors. It may be necessary to make charges or introduce improvements, but such should always be made or introduced in such a way as not to interfere, or interfere as little as possible, with the system of rotation that was originally established.

It may become desirable to change the kind of trees, or it may be necessary to change a mixed growth into a pure plantation, or *vice versa.* Care should be used, in making such changes, not to disturb the growth then going on. Such changes should only be made when the copse is cut down, or in any vacant places that may be found. It would be unwise completely to change the copse at a single cutting. It would be much wiser to await several successive cuttings before the change is completed. By so doing, the growths will not be seriously disturbed, but the cuttings will continue to come in, in the proper order.

Let us now suppose that our copse has reached the period of the growth allotted to it, and that it is to be cut down. If it contains trees valuable for mechanical purposes, a certain number of fine straight trees should be selected and marked for preservation, say one every fifteen or twenty feet. The marking may be done by tying willow twigs or straw whisps around them. Marking them by blazing the trees should be carefully avoided, as that will materially injure the value of the timber. The trees so selected and marked must be carefully preserved, in felling the surrounding trees. They will be allowed to grow until the next period of cutting, by which time they will have grown to such a size as to make them useful for many mechanical purposes. In this way the value of the crop will be materially increased. At this second cutting, new trees must be selected for preservation for a second period of growth. This system being pursued at the successive cuttings, the farmer will annually have a certain amount of valuable timber for sale while at the same time he has an ample supple of wood for fuel and other purposes around the farm.

In many parts of Canada and the United States, the farmers are carefully husbanding their remaining woods, but few steps are taken to renew them. How much wiser it would be, where such woods are preserved for house use, if their owners would at once take steps to convert them into copse. When a piece of woodland is cleared, it would be much wiser if steps were taken to have it grown up again with trees, than to allow the stumps to rot out and the land to be grown over with weeds or grass. By converting even a small piece into a copse each year, a supply would be provided for future generations.

[In this excellent contribution, our correspondent, we think, has somewhat over-estimated the importance of the Maple and the Beech, as grown from the stumps of a cutting. At least within the range of our experience, while sprouts will appear abundantly from both these kinds of trees, they do not promise that success in our climate that is realized in Europe, where, on the general average, it is more humid. In a system of management, called "*Fuertage*" by the French, the Beech is made to succeed very well, in certain districts, by cutting a part only of the young trees upon a stool at each period, so that there are always found growths of two or three ages at the same time.

The Linden, or Bass-wood, might be added to the list of trees that grow from the stumps, when cut close to the ground, with great advantage; and this tree is every year becoming more valuable in carriage making, cabinet making, for carving, and for many other uses, in which whiteness, lightness, and toughness are desired. By a process now in use at several mills in the country, continuous sheets, of any desirable length, are sawn from a cylinder of the wood slowly revolving under a saw. By this means, logs that may be somewhat defective in the center, may be cut without waste.

In treating a piece of woodland for coppice growth, too much care can not be taken to cut the timber late in winter, or very early in the spring, so as to get the full impulse of the spring growth for the young shoots. It has sometimes been found difficult to meet this requirement, in regions where the Oak is grown for the bark as well as the wood. The bark can only be peeled after the sap has started, and the season for best growth is well advanced before the time for peeling is over.

In any system of management which contemplates continued production and cutting at short periods (15 to 30 years), we would rather insist upon keeping out cattle altogether. There is always more or less of natural seeding going on in a protected forest, and at every cutting there will always be some young trees too small for use and too valuable to loose the growth of. Such seedlings would be very much exposed to total destruction, if cattle had the range where they grew. While we fully appreciate the value of woodland shade for cattle, we would prefer to have a portion set apart for this purpose, while the rest was reserved for forest growth alone. A farmer might feed a few head of cattle in his meadows, and still cut hay; but no prudent man would follow such a practice. The case is strictly parallel, when applied to groves of trees intended for permanent maintenance; and nothing less than entire exclusion, is consistent with this end.—EDITOR.]

THE POPLAR FAMILY.

BY PROF. SERENO WATSON, OF CAMBRIDGE, MASS.*

THE genus *Populus* stands at the head of all our deciduous trees, in one respect. It is the only one that ranges over our whole area, from the Atlantic to the Pacific, and from the Gulf and the Mexican Boundary to British America. The Willows, Alders, and Birches, extend across the continent; but only as shrubs between the Mississippi and the Sierra Nevada. The Oaks and Buttonwoods also reach the Pacific, but only through the southern tier of territories. There is not a State or territory in which some one or more of the species of *Populus* may not be found at home, and attaining the dimensions of a respectable tree. This fact speaks for itself, and need not now be dwelt upon.

Unlike the much larger genus *Salix*, the members of which are all popularly known only as "Willows," the kindred genus, *Populus*, is as generally divided into three groups, the "Aspens," the "Cottonwoods," and the "Poplars." This division has, in fact, a scientific basis; and, in the consideration of our subject, we can not do better than to accept this grouping. All are characterized by a resemblance to the Willows, to a greater or less degree, in their fondness for water, the readiness with which they are propagated by cuttings, the rapidity of their growth, and the light and soft quality of the wood.

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* Communicated to the American Forestry Congress at its first meeting.

The Aspens have smooth or smoothish bark, an ovate leaf with a flattened stem, which causes its perpetual quivering motion in the wind, and a narrow seed-pod and minute seed. They also are the least in size, rarely exceeding a height of 50 feet. We have two species, the "Quaking Asp" (*Populus tremuloides*), and the "Large-toothed Aspen" (*P. grandidentata*). A third species (*P. heterophylla*) also technically belongs here, though it has rougher bark, a round leaf-stalk, and becomes a somewhat larger tree. The two latter are confined to the Atlantic region, from the Alleghanies and Western New England to the Mississippi. The Quaking Asp, on the other hand, is of very wide range, extending from the Arctic zone to all our northern States, to New Mexico, Nevada and California. In the western mountains it is found reaching an altitude of 10,000 feet or more. It is peculiar in its habits, growing usually in dense groves in moist valleys, or on mountain slopes, to the exclusion of everything else, the straight, smooth, slender trunks very uniform in size, though never large. In the newer territories, its long straight poles are sought for fencing, and notwithstanding the generally poor repute of the wood of this genus for out-door uses, they are said to be more durable than pine.

The Cottonwoods are larger trees, with at length rough, cracked bark, the triangular leaves with a scalloped margin and flattened stalk, and the much broader pods with larger seeds. Their range is southern, scarcely passing to the north of latitude 42°. The species, as at present recognized, are two, the "Necklace Cottonwood" (*Populus monilifera*), and "Fremont's Cottonwood" (*P. Fremonti*). The first is eastern, probably not reaching the Rocky Mountains—the other extends, in two or three varieties (which may possibly be distinct), from California through Nevada, Arizona, Utah, and

New Mexico, to Colorado. They are found upon the borders of streams, and not to any great altitude in the mountains.

The Poplars, finally, are still larger trees, with thick and deeply cracked bark, the heart-shaped or lance-shaped leaves on round foot-stalks and slightly toothed, the pods and seeds large, and the buds copiously coated with resin. These are northern trees, and we have three species. The Balsam Poplar (*Populus balsamifera*), ranging from our Northern States to Colorado and Montana and northward—the Narrow-leaved Poplar (*P. angustifolia*), in the Rocky Mountain region—and the Hairy-fruited Poplar (*P. trichocarpa*), in the Pacific ranges, from California to British Columbia.

We have here, therefore, a family of trees which, in its several members, is adapted by nature to almost every extreme, whether of latitude, longitude or altitude, that our country affords. Taking this in connection with the extreme ease of their propagation and the usual rapidity of their growth, and we have the main reasons for considering these species as the surest, readiest, and often the only, resource in forest-culture over large portions of our territory.

Though in general found in the neighborhood of water, yet this is not essential; as they will grow with vigor wherever there is a damp substratum within reach, and wherever any other tree will live. Nor is a rich soil needed for them. On the high treeless plateaus of Washington Territory, bordering upon Idaho, a growth of Aspens often springs up voluntarily when provision is made against the usual autumn fires, and the Poplar is the tree that is planted in taking advantage of the territorial laws favoring tree-culture. In Utah, upon the dry slopes bordering the desert, the Mormon colonists plant the Cottonwood and Poplar with success; and on the windswept plains of Kansas, I am told, that, in the shelter of a mere furrow turned up across the prairie, there will soon spring up a line of young Cottonwoods marking its track. And, moreover, for their economic uses, these trees are not to be despised. They afford a very fair fencing material, considering its quickness of growth, and, therefore, ready replacement. They afford a good quality of fuel, burning freely and giving a strong steady heat without smoke or snapping. The quality of the wood varies to some degree in different species; but, in general, the lumber which they furnish, though not suited for exposure to the weather, is well adapted to in-door uses, enduring and sufficiently strong. It works well under the plane, and, from its lightness, softness, and fine even grain, is excellently suited for many minor purposes. The use of the wood in the manufacture of paper-pulp is well known.

Again, for ornamental purposes, the value of this family is not duly appreciated. Some varieties have long been cultivated here and in Europe, but there are others which are more worthy of it. None of the western species have, I believe, been planted at the East. They differ considerably in their habits of growth; but all in their place are handsome trees, and deserve a more general introduction. No more noble tree is grown by us than the true Balsam Poplar, as it is seen in the mountains of Montana, with its straight, clear, massive trunk, gray and deeeply furrowed, and a hundred or a hundred and fifty feet high.

The objection that may well be made to the cottony clouds with which they fill the air in the fruiting season, is readily avoided by the planting of only the staminate form.

I have thus briefly called your attention to this important group of trees, confining myself, as I suppose was intended, to our native species—and I have done this the more willingly, as I am confident that they are better, in every respect and for any purpose, than any foreign ones that can be introduced.

WHAT SHALL WE DO WITH OUR ELEVATED SWAMP LANDS IN OHIO?

By M. C. READ, of Hudson, Ohio.

THE typical characteristic of the topography of Ohio, is a broad table-land, which forms a water-shed between the Ohio river on the south and Lake Erie on the north, and over which are scattered a very large number of small swamps, lakes, and ponds. These constitute well defined separate series or chains of lakes and swamps, occupying depressions or passes which cut this table-land nearly at right-angles, where no bed-rock is found, generally before a depth of 200 feet from the surface is reached, with hills often several hundred feet higher on each side of the pass, and always with rock cover extending nearly to their summits. These passes mark the locations of pre-glacial cañons, which sub-areal erosion carried to the depth of many hundred feet, and to the depth of at least 200 feet below the present surface of the lake, the land being then much more elevated than now. The agencies which covered this table-land with a thick mass of northern drift, filled also the bottoms of these cañons with drift, greatly increased their width at the top, and left, as the final result of their action, these chains of swamps and lakes, marking, probably, the location of immense masses of grounded ice left by the retreating glacier. All of them had originally, and some yet have, outlets both to the north and to the south, and they are the sources of most of the rivers emptying into the Ohio and the lake. Subsequent agencies have tended to the entire obliteration, or to the diminution, of the area of all these swamps and lakes. Their outlets have been deepened by erosion, their bottoms raised by sediment derived from the wash from the hills, and their margins every-where encroached upon by a dense mass of swamp vegetation. These influences have already, in many instances, changed lakes into marshes, and these marshes into arable land. The vegetation which encroaches upon them most rapidly is of a peat-forming character, which has, in some instances, entirely filled the old lakes, in others has bridged them over until this peat surface, resting upon the water, has attained a thickness which suffices for the support of a dense forest. Railroad engineers have often encountered almost insurmountable difficulties in crossing these buried lakes, and roadways, and after more than fifty years use, loaded with an increased weight of earth and gravel, when weakened on each side by ditches, and the decay of supporting roots, they have suddenly become submerged and sunk out of sight. All of these lakes and swamps are very important factors in determining the climatic peculiarities of the State.

In their natural condition, the dense mass of swamp-vegetation, surrounding them, retards the flow of water into them, holds it as in a sponge, reduces the inward flow of earthy matter to a minimum, and, choking up their outlets, diminishes their erosion, sometimes filling up and obliterating them, and in all cases dams back the water, making its exit slow and gradual, enabling a larger part of it to penetrate deeply into the rock strata below to become sources of supply for distant springs.

Their beneficent influence in this respect has been greatly diminished by human agencies, since the settlement of the country. Many of the swamps have been cleared and ditched. The forest and undergrowth have been stripped from the margins of the lakes, and in many places a thick turf, almost impervious to water, covers the slopes down which the rainfall flows into the lake, almost as if from the roof of a house. The outlets have been deepened and widened, and efforts, more or less persistent, are made to keep them free from all growing vegetation. The result is already apparent; small streams which, in the early settlement of the country, afforded water-power for mills throughout the entire year, are now alternately flooded and dry. Our interference with these natural reservoirs has compelled the water, during periods of great rain-fall, to rush rapidly into the swelling rivers, producing destructive floods; and, during protracted drouths, leaving dusty beds in the place of what was once perennial streams.

It is a very important practical question, whether we shall go on and carry to completion the work we have commenced, and thoroughly reclaim and put under cultivation the residue of these swamp lands; or shall we utilize them for the work they were designed to do in the economy of nature? Much can be said in favor of each of these questions.

The drainage laws of the State are formed upon the assumption that their complete reclamation is desirable, and they recognize the fact that these swamps can not be drained without greatly reducing the area of the lakes, with which they are connected, and whose waters occupy substantially the same level with that of the swamps. They provide, in a certain degree, for the compulsory drainage of these chains of swamps and lakes—that is, when any of those whose lands will be immediately affected by the drain, petition for one—the county commissioners may establish and locate the drain, and apportion the cost upon all who are immediately affected by it, disregarding entirely the wishes of the minority, and even of the majority, if they so choose. The commissioners, of course, are expected to look only upon the effect of drainage as it influences the particular area drained by the ditch. No one expects that they will inquire as to the effect upon the flow of the streams in a neighboring county. If they attempted this, the land-owners in favor of the ditch would very naturally ask, by what right do you undertake to say I shall not make the best use I can of my own land, because of a fancied climatic injury to the distant lands of others? True, the wise maxim of the law, which requires that each one should so use his own, as not to injure another's, might be a sufficient justification of such a refusal; it would be one hard to be understood by the interested land-owner.

It is also true, that these swamps, when reclaimed, become our most valuable and most productive lands, and that they do not generally maintain the most valuable forest growth. The owner of elevated swamp lands, which can be drained at a moderate cost, can probably secure larger pecuniary returns from his land by draining and cultivating it, than he could obtain from it as a forest-reserve. And if this is so, this work of drainage threatens to go on until the State, instead of encouraging it, interferes to prevent it.

It may be well, therefore, to anticipate in imagination the conditions that will be produced by the complete reclamation of all these swamp lands. As has been already stated, they form parts of a chain of which the lakes scattered along the divide is also a part, their drainage requires an important diminution both of the area and depth of the connected lakes. The work demands that the outlets of these lakes be kept open and free from all obstructions, and increases largely the action of all the agencies which tend to the filling up and the obliteration of all of these lakes. In the end they will all disappear. Under cultivation, the spongy, peaty soil of these marshes becomes steadily more finely comminuted and compacted, the carbonaceous matter burned out of it, the surface settling downward, and requiring deeper drainage to render the land tillable. The old lakes, now deeply filled with peat, require a network of open drains to fit them for tillage, and, with the growth of peat forming plants on the surface arrested, will become steadily more and more compacted, capable of absorbing less water year by year, until their character, as reservoirs of water, is substantially destroyed. The buried lakes, constituting subterranean reservoirs, will retain their character much longer; but the necessities of cultivation will require measures to secure as rapid surface drainage as possible, which will become more perfect as the soil becomes more compacted, so that, in time, *all* of these natural reservoirs will be substantially obliterated.

This table-land having no barren mountains too rugged for cultivation, and no swamps which can not be reclaimed, invites thorough cultivation, which will leave over the whole divide no forests or swamps of sufficient size to interfere materially with rapid surface drainage. And while there is no State in the Union having less waste land than Ohio, and none which is susceptible of more thorough and profitable culture, there is no other one where the danger from the destruction of forests is so great.

Ohio is indeed peculiarly situated. As has been often remarked, it stands in the great highway of the nation; the western emigration and commerce from all of the New England and the old Middle States, presses over it as does the great returning waves from the boundless West and Northwest. The great western water-shed of Pennsylvania, and the north-western water shed of the Virginias, concentrate their waters to form a magnificent navigable river on its southern boundary: while the drainage of the north is concentrated into a grand chain of lakes, no where else equaled, the most southern of which forms our northern boundary. So, also, the agencies which have covered a large part of the State with glacial drift, have laid all the rocks of the north under contribution to furnish mineral elements in our soils.

This very prodigality of nature, which makes the possibilities of the future so great, involves also the greatest possible hazard.

If the streams, which have their origin in the State, had their sources in broad, level prairies, where the surface drainage is imperfect, and the mass of the rain-fall is absorbed by the soil, or in barren hills and mountains, our future would be secure.

But this central table-land of the State is composed of a succession of undulating ridges, from which the drainage is rapid, until the water reaches these passes or depressions, in which the lakes and swamps are situated. The natural drainage from these is slow; but when the conditions are reached, toward which we are tending, it will be so rapid that very little effect will be produced by these depressions in retarding the flow of the surface water. It will escape almost as fast as it falls. The destructive energy of floods will be vastly increased. The volume of all the streams greatly diminished in drouth, and many of them entirely obliterated. The full climatic effect of these changes can not be predicted, but they will unquestionably be disastrous, and result in serious injury to our agricultural interests. It is certain that the rain-fall will not be as equally distributed as now; and there is but little doubt that the annual amount will be much diminished.

These results can not be prevented, except by arresting, in some way, the present tendencies of the farming operations on this central divide, where the forests are now rapidly disappearing, and the area of the lakes and marshes is steadily diminishing.

Charles Ellet, civil engineer, in a paper published in Vol. II. of the Smithsonian Contributions to Knowledge, in 1849, recommended the building of artificial reservoirs on the upper tributaries of the Ohio, for the purpose of equalizing the flow of water in that stream, and showed that it was not an impracticable scheme to undertake to maintain, by that means, the navigation of this river during periods of the greatest drouths. We are systematically destroying just such reservoirs at the heads of the Ohio streams. How can we prevent this destruction? The canals of the State afford us some aid. The demand for a constant water supply at their summits, involved the necessity of increasing the area of some of these natural reservoirs, and of maintaining the water in them at such a level, as to make the drainage of the connected swamps impossible, thus receiving the appropriation of the swamps for forest reservoirs, because it was rendered impossible to make any other use of them. Our Canal Commissioners can aid us by a management which will make these canals so useful as to secure their perpetual maintenance, and with such an amount of business as will require the construction of other and larger reservoirs.

Our Fish Commissioners can help us. If they will so stock all of these lakes and artificial reservoirs with valuable fish, that the adjacent land-owners can draw from them a valuable supply of food, they will become interested in their protection, and public sentiment will demand that these areas be not diminished. It is probable that, in this way, these lakes can be made so valuable, that volunteer efforts will be made for their enlargement, with the expectation that the lakes and the timber, and wood from the adjacent marshes, will be of more value than the net profits of the marshes, if reclaimed and cultivated.

The proper education of the people in forest lore, will also teach them the importance of maintaining a proper forest reserve on every farm, and will lead to the preservation of existing forests by some, and the planting of new forests by others.

And as it is evidently true, that, on this elevated divide, forests are of much more value to the entire State, than if located any where else, if these influences do not suffice to secure an adequate reserve, it would become entirely proper far the State to interfere, and, at the expense of all the citizens, secure the construction of enlarged reservoirs, and enlarged forests.

There are, however, so many obstacles in the way of efficient State action, that it is probable we will be compelled to rely upon other agencies, and to trust wholly to the properly educated good sense of the people. But the time for action is before the evil becomes irremediable, and doubtless a full discussion of the subject will suggest other influences and other aids not referred to in this brief paper.

UPON THE PROFITS OF FOREST CULTURE.

By the Editor of the American Journal of Forestry.

AMONG the motives likely to influence the owners of land, in the question of planting forest trees, is that of the pecuniary profits that may result, and the amount of these earnings of the land, as compared with other forms of investment. It would be natural for them to inquire as to the worth of his crop at different stages of its growth, and as to its final value, and the chances of its being impaired by various casualties, during the long interval of its growth.

It is not probable that forests will ever be planted, as land is sometimes cultivated in farm crops, upon hired land, not even upon that leased for long periods, for no one would care to make an investment of this nature, beyond such as would bring its full return within the period of his lease.

We will dismiss, then, altogether the element of rent, and consider only the cases of woodlands planted upon the lands of an owner in fee, and in this we gain in the estimate whatever permanent benefits that he may expect to realize from an absolute title.

In a piece of timber land that is ready for cutting, whether for the saw-mill, the factory, or the wood-pile, the cost of the crop may be divided into several elements, all of which admit of exact calculation at the end of the period, and might, with equal certainty, have been reckoned from the beginning. They consist of interest on the cost or value of the land, which, for the present, we will consider as a constant quantity and uniform rate—the taxes—which might also be reckoned as uniform, the cost of the labor incurred in starting by seed, transplanting, or otherwise, and of after attendance, and the cost of inclosure and protection during the period. We have on the credit side of the woodland, the market value of the products, deducting the cost of cutting and transportation to the place of delivery, where these prices are paid.

The value of a piece of timber land, before the time proper for cutting, like that of a herd of young cattle, is partly prospective. It is not what it actually is for immediate use, if destroyed, but what it *will be* at maturity, less the cost of keeping till that period. In neither case can we afford to sacrifice this future benefit for securing the present worth in material, and if, by debt or otherwise, this must be done, we suffer its loss.

In calculating the profits of forest culture, we assume that the land is yielding no profits, except in the growth of wood; but sometimes there are incidental benefits coming from other sources, such as pasturage, resinage, and the like, besides the wood taken out in the thinnings. Although the latter may appear to be a sacrifice of a part of the capital invested, it is really but a transient one, for the loss is soon made up in the increase of growth, and, in the end, proves really so much clear gain. In European countries, these thinnings have a market value almost from the first, as faggots, poles, rafters, and other small timbers, or as fire-wood. If the owner finds time to trim out the dead branches of his woodland, he would undoubtedly realize in the end a return for his labor in the increased value of his material. He could always well afford to allow this to be done for the brush, and as fuel becomes scarce there will even be some profit from this source. In a recent journey among the Pine plantations on Cape Cod, we found that in some cases, families had sought the opportunity of getting their fuel from the trimming of the dead branches. In dense groves of young Pines, like these, the lower branches soon get shaded out and die, leaving underneath the dome of verdure at the top a confused and tangled mass of dead brush, and the owner might well afford to give away all that could be taken out, and with it many of the smaller trees entire, for the sake of the benefits that would be gained to the growing crop.

The rate of growth of a tree, whether reckoned in contents or in value, might be compared with one of the geometrical curves, which, beginning on a level base line, rises slowly at first, but gradually becomes steeper, and then again bends down to a horizontal direction, as the growth comes to full maturity, and is about to decline. If we cut off a tree, or a grove, at the early stages of its growth, we take it at the time when it is gaining in value at the greatest rate, and we should remember that in doing this, we are sacrificing a valuable future for an inadequate present worth.

In assuming that the value of the land is stationary during the period of growth, we have granted more than is due; for while agriculture, unless skillfully managed, tends to a depreciation in value, and, under improvident tillage, to exhaustion to a low degree, forest culture, on the contrary, is tending constantly toward improvement in the formation of humus from the fallen leaves; and this increasing value may finally bring up the fertility, even in lands spent by cropping, to a degree equal to that observed in the first years of cultivation. We have yet to learn, from long and careful observation, as to the place that forest culture should hold in a judicious system of land management, in which we may expect to realize the greatest possible values, for long periods, and without final depreciation, by the alternate growth of woodlands and field crops. But the general effect will be found as we have stated, viz: That while tillage, unless sustained by fertilizers, tends constantly to waste, woodland growth tends to improvement.

As to the future value of timber products, we know what to expect from what we know of the past. With a steadily increasing demand, and new uses arising every year, we find the supplies visibly wasting at a much more rapid rate than the restoration by natural growth. We see one region after another worked out and exhausted. The land is either appropriated to agriculture, or, after being burned over, and the humus in the soil burned out by fires, it is left to the slow process of natural restoration by spontaneous growth, or lies an utterly barren waste, and if the soil be very light, perhaps to a region of drifting sands. The dream of "inexhaustible supplies" vanishes before the realities, too soon experienced, and it does not need any special gift of prophecy to assure us that by the time that the seedling of to-day becomes a tree fit for the timber yard or the mill, its market value will be very greatly advanced above the present rates.

Considering in these estimates the value of materials alone, aside from the incidental current benefits to agriculture, or other interests, concerned in climate, water supply, or the public health, we can readily see that an investment in forest tree planting, may, under intelligent management, become a safe, profitable, and often a lucrative operation. It has, probably, fewer uncertainties than can be found in any other forms of business enterprise. There is the least possible risk of an over-supply of the markets. We may know with reasonable certainty beforehand, as to what will be the quantity and quality of our product at a given future period, and we are equally sure that it will sell when ready for all that it is then worth, and for more than its present price.

We are to consider another and most important question in this estimate of the advantages to be expected from forest culture. Although the richest soils will grow the most timber, as well as the best crops of grain, we will not deny that, upon alluvial flats, and in other places well situated for cultivation, there will be more profit, at present prices, from judicious tillage, than in any form of tree growth to which these lands could be applied. But on the best of land, there are river banks, ravines, and waste places along fences, and the like, where the soil is exceptionally rich, but not accessible for other uses, that might be made to render substantial service by planting with trees suited for these places. They might, moreover, prevent erosions, consolidate banks liable to slide, protect water-courses and springs from evaporation, and in various other ways confer benefits which should be allowed as credits in their favor. But it is chiefly on broken and stony lands, worth little for pasturage, and nothing for arable uses; on worn out lands, where the surface soil has been exhausted of the elements that are needed for farm crops; on light, drifting sands, and on steep declivities that can not be cultivated with grains, and that should not be pastured, that the opportunities for profitable forest culture appear to the greatest advantage, and where the profits have little or nothing to balance them on the side of farm cultivation, for they would have produced nothing. We here secure not only a gain in material products, but secondary advantages worthy of notice, in places where the capital invested in land would have lain dormant, or would have run to waste.

To any person familiar with business transactions in the United States, it is needless to prove that, in recent years, it has become a matter of anxious inquiry among those having surplus money above the need of present use, as to how it may invested with the greatest security—at the best rate of earning, and at the least risk of loss.

This financial problem is evidently a sequel of our late war, and results from the paying off of the bonds that were issued to meet its emergencies, and that bore six and five per cent—often at the earliest moment that they could be redeemed, and either by the payment of their full value in money, or by the issuing of other bonds at greatly reduced rates of interest in their place.

This evidence of national prosperity, however flattering it may be to national pride, becomes a matter of very serious personal inconvenience to the recent owners of these bonds, who find their incomes suspended, until they can find some other safe and productive mode of investment. They find the rates of interest, which had been long established by law and custom, reduced on every hand, and are compelled to seek for some other way of placing their money, where the principal will be secure, and the earnings reasonably certain.

It may, therefore, be well to compare, by the recognized rules of political economy, the kind and degree of security that is offered to capital and labor in several of the great productive industries of the country, and to consider the questions of profit and loss that they present, with the view of ascertaining the proper place of forest culture as an object of pecuniary investment.

In every industry where money is employed, there are certain elements of expense which must be taken into the account, in all estimates of profit and loss, and which have already been noticed, in respect to forest culture. In the most general way, and as applied to all industries, they may be classified as follows:

1. *Interest on the permanent capital* invested in land, buildings, structures, improvements for rendering it available, machinery, and sometimes a payment by way of rent, patent, royalty, or license for the privilege.

2. *Interest on the working capital*, including supplies of material, repairs and maintenance, office expenses, agencies, sal-

aries and commissions, insurance, labor, and the cost of storage, packing, freight, etc., and sometimes provision against losses resulting from accident, deterioration in keeping, delay in sales, and fluctuation in market values.

3. *Taxes and assessments* of national, state, and local governments.

We will arrange the productive industries under the five following classes, vis.:

1. *Mining, Quarrying and other business depending upon Mineral Substances for their principal Material.*

2. *Manufactures, or the change of a raw material of whatever kind, into some other commodity of greater value, by the aid of any Manual, Mechanical, Chemical or other process.*

3. *Commerce and Inland Transportation, of every kind.*

4. *Agricultural Industries, in their widest sense, including the productions of all vegetable and animal commodities, with the exception of those from Woodlands*, and

5. *Forest Culture, including the production of forest-products in its first forms for delivery to Commerce, Manufactures or other use.*

We will now proceed to consider these several divisions of the productive industries, in the order we have here placed them:

1. *Mining, Quarrying, and all business that consists in the procuring of Mineral Substances in any form, as commodities for sale, or as first Materials for Manufacture or use.*—In mining, considered in a collective way, without reference to particular investments, we should include with the original cost, whatever is spent for discovery add improvement, before the question of profit can be ascertained; and in the general result, there is perhaps nothing in the whole series of the industries, that presents a sadder record óf blind uncertainty and disappointed hope. When a vein or bed of ore or other mineral is found, the extent and value are generally unknown until tested by costly labors, and whatever may be its real worth, it must necessarily become less as the work progresses;—for every ton of ore removed, is so much less of supply, and the cost of removal is often steadily increasing until in the richest mines, it finally becomes a question, as to whether it will pay the ex-

pense of working, on account of great depth, with consequent heat, the influx of water, or other causes.

The intrinsic value of the real-estate, being always uncertain, becomes too often a subject of speculation by unscrupulous adventurers, who seek to magnify the probabilities of profit, or to conceal the chances of loss, or the reverse, as may suit their purpose, by every artifice of misrepresentation and fraud.

As to the other items of mining investment, such as structures, buildings, machinery and other improvements, they must be provided, whether the result is profitable or not:—they increase in expense, as the work progresses,—require repairs and renewals, and in the end are greatly depreciated in value, if not a total loss. The other items of expenditure, bear no certain relation to the profits, and all of them become certain as to the outlay, whether the business becomes profitable or not.

To sum up:—a mining investment for actual gain, can never be undertaken safely, unless capital is associated with skill and science; and while it presents some instances of brilliant success, it shows a vastly longer record of dismal failures,—some of which might have been avoided by a proper knowledge of the true conditions, while others were of a nature that no science could forsee, and no skill could overcome. As a speculative investment mining presents all the uncertainties of blind chance, which the prudent will avoid, and from which none but fools will suffer.

As to the other indurstries in our first class—the production of mineral substances other than ores, such as stone, clay, sand, etc., every thing depends upon the demand; and where the supply is ample, the relation between the cost of production, and the value of returns, will of course determine the profits. Most of these may be known definitely beforehand, excepting the question of competition from new localities, that may furnish a better article, or undersell in price.

On the whole, they may be regarded as limited in opportunity, but reasonably certain, when managed with good business talent, and to the extent that the demand justifies.

2. *Manufactures.*—In these we find an infinite opportunity, but generally to those only who can give personal attention to

the business. A good business talent can alone lead to success,—but this can not always surmount the obstacles arising from competition—from fluctations in the cost of materials and labor, or from changes in demand. It is necessary to consider the amount and permanence of supplies—the chances of accident or loss, before, during or after the manufacture, and the probabilities of sale, as they may be influenced by competition, or from changes in fashion, or new inventions in the arts, or new discoveries in science.

(To be concluded.)

FORESTAL EXPERIMENT STATIONS IN GERMANY.

By ADOLPH LEUÉ, Secretary of the Ohio State Forestry Association.

[This is a part of a paper entitled "Our Next Problem," read at the Convention of the Ohio State Forestry Association, held in Cincinnati, April 25th, 26th, 27th, 1883.]

THE great importance of exact experiments in Forestry, was felt by two German foresters, Hundshagen and v. Wedekind, as early as 1826, in which year the latter proposed the organization of a society for forestal experiments, but, as the proposition was not sufficiently indorsed, it was dropped for the time being. Several subsequent attempts to institute comparative experiments failed, until 1868, when, on the 31st of August, at a Congress of German Foresters, held at Vienna, a committee, consisting of Gutav Heyer, Franz Bauer, Ernst Ebermayer, Fr. Fudeich, and J. Wessely, was appointed, to consider the question: On what plan such forestal experiment stations should be organized. This committee met on the 22nd of November of that same year, agreed on a plan of organization, and questions to be subjected to investigations and experiments. The report was adopted by the German Foresters' Congress, and submitted to the several governments, which were to bear all the expenses of these stations.

The first station was organized in Baden on the 16th of April, 1870—Saxony, Prussia, Wurtemberg, Austria, Bavaria, Brunswick, and Hesse, followed in the order mentioned. The stations in all of the just named States, with the exception of Austria, which has an organization of its own, have formed a union, called "The Association of the German Forestal Experiment Stations."

The great aim of those stations is, to furnish a scientific foundation for a rational management of forest, based upon exact experiments and careful investigation. They are intended to determine the significance of forests in the economy of nature, to try the various methods of forest management, to examine the advantages which one method may have over the other, and, finally, to establish a plan of forest administration, which will enable the owners of forests to realize the greatest possible profit from forests, and at the same time reduce the expenses of their administration.

Among the many problems to be solved through the agency of these stations, are the following: to determine the influence of forests upon soil and climate; to investigate the relative value of the several methods of thinning; to establish reliable tables of increase, and methods of valuing forests; to study the foes of the forest, both animal and vegetable, and to devise means of successfully combating them; to determine the value of forest-litter upon the growth of trees; to test the relative value of forest implements; to devise new methods of obtaining forest products, and to find new uses for the same; in short, they are intended to furnish the means by which to increase the wealth of the owners of forests, and thus that of the entire country, and to furnish legislative bodies with the foundation necessary for a just taxation of forests, and for a wise and beneficient code of forest-laws.

To fully appreciate the thoroughness of manner in which the work of solving these problems is performed in Germany, a glance at the organization of the Forestal Experiment Stations in that country, will be of some advantage.

These stations are State institutions, connected with schools of Forestry.

In Prussia, with the Forest Academy at Eberswalde.
In Bavaria, with the University at Munich.
In Saxony, with the Forest Academy at Tharandt.
In Wurtemberg, with the University at Tübingen.
In Baden, with the Poletechnicum at Carlsruhe.
In Thuringia, with the School of Forestry at Eisenach.

In Hesse, with the University at Giessen.

As all these stations are, with only some immaterial differences, organized on the same general plan, and as the examination of but one will answer our present purpose, I would now ask your attention to the organization of that in Prussia:

According to an ordinance issued by the Minister of Finance, on the 14th of March, 1872, the Forestal Experiment Station of Prussia was organized, and connected with the Forest Academy at Eberswalde, and placed under the control of the Central Forestry Division of the Ministerium of Finance. This station consists subjectively of five divisions, namely: a forestal, a chemico-physical, a meteorological, a vegetable-physiological, and a zoological; locally it consist of the chief station at the Forest Academy, and a number of secondary stations in appropriate Chief Forest apportionment. The chief station embraces all of those five divisions, while the secondary stations have either a forestal and meteorological, or only one of them.

The general superintendence of the experimenting is vested in the director of the academy, who acts as Commissary of the Central Forestry Division. He makes all the estimates of the expenses for experimenting, and, after due consultation with the chiefs of the several divisions, determines what experiments and investigations are to be undertaken, and how they are to be made. At the end of the fiscal year, he submits, in an annual report to the Central Forestry Division, the results of the work done at the station.

Each of the afore-named five divisions has its chief, whose only duty is to carry out the work assigned to his division. Yea, according to the magnitude of work, he has one or more assistants.

The secondary or sub-stations, which are unlimited in number, are under the direction of the *chief forester*, in whose division they are located. The importance of these sub-stations can not be estimated too highly. The problems assigned to them are, as a rule, of an exceedingly great practical value to practical forestry. In order to obtain reliable results, only the most competent and conscientious of the Chief Foresters are selected for making the experiments, which are performed after certain definite plans.

The expenses of maintaining the Experiment Stations in Germany, vary greatly, but always in proportion to the forest area of the respective State. For the year ending 1882 the expenses of the

Station in Prussia, amounted to 27,000 marks = $6,750
" " Bavaria, " " 44,000 " = 11,000
" " Saxony, " " 14,000 " = 3,500
" " Wurtemberg, " " 7,000 " = 1,750

The entire amount of money expended for the maintenance of Forestal Experiment Stations in Germany, amounts to about $30,000 annually.

These stations have, as already stated, formed an association whose great aim is to facilitate the objects of experimental Forestry, by joint plans of experimenting, by a proper division of labor, and by publishing the comparative results. The business management of this association has been confided to the station at Eberswalde.

I can not dismiss this subject without having alluded to the plans of labor, or the manner in which the experiments are conducted. A detailed account of these experiment would lead too far; I shall therefore confine myself to the main features of but two.

Experiment with forest-litter.—The aim of this experiment is to determine the objective value of forest-litter, and its value to the growing forest. In order to obtain reliable results, the experiment is now being made at a number of stations in various parts of Germany. A tract of a forest section of five acres, stocked with only one kind of trees, which are all of the same, or nearly the same, age, is selected. This area is divided into five equal parts, which are laid out in squares.

From part I., no litter is removed.
" " II., litter is removed annually.
" " III., litter is removed every second year.
" " IV., litter is removed every fourth year.
" " V., litter is removed every sixth year.

This process is to be continued for a period of about fifty years. The object of this method is: 1. To ascertain the exact quantity of litter which one acre produces, which is done by actually weighing it, first at the time when taken from the ground, and then when it is perfectly dry. It is then sold at market price, and the amount obtained credited to that part of the experimenting area from which it was taken. 2. To ascertain the influence which the removal of litter has upon the increase of wood, which is determined by a repeated accurate invoice of the growing wood.

The significance of litter to the growing forest, has long been felt, but never before, in the history of Forestry, has this question been subjected to so rigid a process of investigation, which is certainly well calculated to settle the *forest-litter problem.*

Experiment in thinning.—Though we, in this country, have practiced thinning to an alarming extent, it is nevertheless a subject on which we are badly in need of more light. With a few exceptions, the American idea of this part of forest management has been very ruinous to our country, in that, in many instances, it has left nothing that could remind us of a forest, except stumps of trees and a barren soil.

The object of experimenting in this part of forest management, is to determine the influence of the various modes of thinning upon the growth of individual trees, and to find out the difference in the production of wood. An area of about three acres is selected, and divided into three equal parts.

In part I., only the dead trees are removed.
" II., also the defective are removed.
" III., every tree that does not keep up with the average growth is removed, so that in this part none but choice specimens are met with.

In newly formed plantations the process of thinning is repeated every *fifth* year, and later every *tenth* year. In forests consisting of Oaks, or Beeches, or Pine trees, the experimenting period lasts fifty years, while but forty years are required for the softer kinds. An accurate record of the quantity of wood obtained at the different thinnings of each section is kept. After each thinning an invoice of the remaining trees is taken, and recorded. At the expiration of the experimenting period, when the final invoice is made, the most profitable mode of thinning must appear.

Other questions in forestry are treated in the same thorough manner, and the results obtained thus far are very satisfactory, so that those Forestal Experiment Stations are constantly growing in public favor.

In Memoriam.

DR. JOHN A. WARDER.

IT is proper that this JOURNAL should pay a fitting tribute to the memory of one who was among the earliest, most intelligent, and most active of the laborers on behalf of *American Forestry.* Of no one can it be more truthfully said, that his life was a blessing to mankind. From early childhood, his great object was to do all in his power to make others happy, by aiding them to find pleasure in the beauties and bounties of nature.

Dr. Warder was the eldest son of Jeremiah and Ann Aston Warder. He was born near Philadelphia, Pa., January 19th, 1812. His early life was spent in a suburban home called "Woodside," where he evinced a love of nature, which he cherished through life; and, while a child, his habit of close observation enabled him to give object lessons on trees, plants, stones, and other common objects, during his walks with younger pupils. Bartram and Darlington were among his neighbors, and such men as Audubon, Michaux, and Nuttall, were entertained at his father's house. It was his "good fortune," he tells us, "to walk in the woods of Pennsylvania with a silent, though learned, man from Scotland, who taught him to observe and to love the plants of nature, which himself had crossed oceans and continents to explore and study. In this kind office, Mr. Thomas Nuttall was only fostering the love of nature more early implanted by a tender parent, who had directed the latent powers of observation in her boy." *

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*Ohio Agricultural Report for, 1881, page 75, or "Woody Plants of Ohio," page 3.

In 1830, his parents moved into the western forest, and established another "Woodside," near Springfield, O. He took great interest in comparative anatomy, and other departments of agricultural science. The agricultural colleges (for which he afterward earnestly labored) were not yet inaugurated, and the Jefferson Medical College, of Philadelphia (where he graduated in 1836), afforded the best opportunity to gratify his natural tastes.

Dr. Warder settled in Cincinnati in 1837; and many of the poor found that his professional services were not only rendered gratuitously, but with that kindness that comes from a tender and sympathizing heart. He identified himself with the interests of his city, and his active mind engaged in any measure tending to the diffusion of knowledge or the promotion of science. He had not the means to endow a great college, but he had the same spirit that prompted the New York philanthropist to endow Cooper Institute; and it inspired him, with no thought of his own personal sacrifices or possible reward, unselfishly to give the community his best thoughts.

He was greatly interested in the public schools; and he said there was one office in the gift of the people which he would gladly take, not for any emolument (for the office had none), but for the good that might be effected. He was, accordingly, early elected a member of the school board. This labor of love, with congenial companionship, continued for many years. The board would sometimes meet in his own house. Before the establishment of the high schools, he traveled through eastern cities and states, studying systems of teaching and the construction of school-houses, to introduce improved plans to Cincinnati.

He became a member of the American Association for the advancement of science in 1851; and the next year he served on the local committee for the Cincinnati meeting, with Judge Burnet, Professor Mitchell, Professor B. Silliman, Dr. Jos. Ray, E. D. Mansfield, and Robert Buchanan. While practicing his profession, he was actively interested in the organization and work of various scientific institutions. Among these were the Cincinnati Astronomical Society, the Western Academy of Natural Sciences, the Cincinnati Society of Natural History, the Cincinnati Horticultural Society, the Wine Growers' Association, the old Cincinnati College, and the Ohio and Miami Medical Colleges. He was President of the Society of Natural History for five years, during a period of great discouragement; yet, being fully alive to the educational value of natural objects, when carefully observed, and being confident of the ultimate success of such an institution, he conscientiously attended the meetings, always taking pains to see that some one was ready to entertain and instruct those present, whether many or few, though the subject of the lesson might be only a flower, a pebble, a leaf, or a knotted limb.

When Professor O. M. Mitchell was laboring to awaken an interest in astronomy, Dr. Warder was a faithful friend and an earnest helper. He was for many years President of the Ohio Horticultural Society, and Vice-President of the American Pomological Society. He also served on the State Board of Agriculture. He was among the first to direct public attention to the beautifying of public and private parks and cemetaries; and the present interest in landscape gardening in many parts of the United States, has been largely due to his efforts. In connection with Robert Buchanan and others, he was interested in establishing Spring Grove Cemetery, and was one of the first residents of the village of Clifton. "Scarlet Oaks," where Mr. Schoenberger's house now stands, was for some years his summer residence. With a love for country life, and an appreciation of the beautiful views from the Ohio hills, he bought a part of the farm once owned by President Harrison, at North Bend, O. He gave up the practice of medicine and moved to his new home in 1855, to spend the rest of his life. Much of his time was occupied in testing varieties of fruits and methods of culture. The farm became in fact an experimental station (although he never dreamed of calling it so), and the results of his labors were embodied in numerous papers prepared for horticultural societies or disseminated through the agricultural press.

As a student of nature, Dr. Warder was a close observer, and especially skillful in generalization. In 1850, he began the publication of the "Western Horticultural Review," which was continued four years. An editorial note in the 3rd volume (1853) contains the first published description of the *Catalpa speciosa*, which has since been recognized as a distinct species, and one of the most valuable of forest trees. "A Geological Reconnoissance of the Arkansas River" appeared in 1854. A series of papers on practical entomology, read before the Cincinnati Horticultural Society, was printed in "The Farmer's Home," for 1864. The "Report of the Flax and Hemp Commission," published by the Department of Agriculture, in 1865, was chiefly his work, the result of much patient study and investigation. His excellent manual on "Hedges and Evergreens" appeared in 1858; and "Ameri-Pomology-Apples," published in 1867, was the result of sixteen years of careful investigation. The table of varieties and synonyms, based upon personal observations, includes about fifteen hundred names. He also edited, in 1867, Du Breuil's "Vineyard Culture," introducing many valuable notes, and adapting it to American use.

But it is chiefly his labors in Forestry that claim a notice in this JOURNAL. For many years, his active mind had considered the waste of the present and the needs of the future. In 1873, he was appointed United States Commissioner to the World's Fair at Vienna; and his official "Report upon Forests and Forestry" is a valuable record of both public and private exhibits. His colleagues on the jury called him "Herr-Praktischer;" and the name well expresses his habit of looking for whatever might be most useful to his own country. In 1875 he issued a call for a convention at Chicago, to form an American Forestry Association; this organization was completed at Philadelphia, in September, 1876. As in other new enterprises, the public had not become impressed with the importance of this subject; the labors of Dr. Warder were in advance of his time; but this pioneer association gave form and method to the needed plans for united effort. In the winter of 1879–80, with the approval of various agricultural and horticultural societies, Dr. Warder memoralized Congress upon the appointment of a commission for the study of Forestry in Europe; but his only reward was a partial success in stimulating public sentiment to recognize our needs. When the American Forestry Congress met in Cincinnati, April, 1882, it was his comprehensive knowledge of Forestry, and of those who were interested in different phases of it, that secured so varied a programme, with names from all parts of the United States and from Canada. At that time an interest was thoroughly aroused. It was determined to have another meeting at Montreal in August. But it was undesirable to continue two international organizations of like character. Dr. Warder, accordingly, called a meeting of the older association at Rochester; and, with characteristic self-forgetfulness, he withdrew from the presidency in order that this older body might more readily be united with that of more recent origin.

In 1883, at the organization of the Ohio State Forestry Association, he was chosen Honorary President. A Congressional bounty upon the destruction of our own forests (in the form an import tax) was then before the public, and, with the authority of the association, he prepared a strong memorial to Congress on behalf of our trees. Soon after, he was appointed an agent of the Department of Agriculture to report upon the Forestry of the North-western States. But he was attacked by an illness, under which he gradually sank; and death ended his active and useful life on Saturday, July 14th, 1883.

He was a member of the Society of Friends, to whose principles he was strongly attached; and his character was marked by a true love of peace, speaking evil of no man, and by unusual purity of thought and word. His studies and investigations of nature did not lead him into the cold and cheerless regions of unbelief, but to a deeper recognition of the Creator, whom he often lovingly and reverently acknowledged in his public addresses. In accordance with the extreme modesty and humility of his character, there was no gathering of numbers to follow him to his last resting place; brief services of scripture and prayer were more appropriate for that hour than any eulogy. Borne by his four sons, his body was laid to rest under the shade of his own beautiful Oak-tree in Spring grove Cemetery.

The following list includes some of his later papers. A number of reprints may be had on application to the Publishing Committee of the Ohio Mechanics' Institute, especially by societies that exchange publications with the Institute:

REPORT ON FORESTS AND FORESTRY; Government Printing Office, Washington, 1875.

FORESTRY AND ITS NEEDS; an address before the American Forestry Association, February, 1878.

AN ADDRESS ON FORESTRY; read before the Otoe Co. (Neb.) Horticultural Society, September 12th, 1878.

FORESTS OF NEW JERSEY; *Proc. N. J. State Hort. Soc.* for 1878.

GROUPING IN FORESTRY PLANTATIONS; *Trans. Iowa Hort. Soc.* for 1878.

MOUNTAIN FORESTS AND THE WATER SUPPLY OF THE CONTINENT.

THE TWO CATALPAS—A MEMOIR OF THE SHAVANON; *Gardener's Monthly and Horticulturist,* March, 1879.

REPORT ON THE CATALPA; published by E. E. Barney, in *Additional Facts and Information in Relation to the Catalpa Tree,* 1879.

THINNING, TRIMMING AND PRUNING THE FOREST; the (Minn.) *Forest Tree Planters' Manual,* 1880.

FORESTRY FOR INDIANA; *Trans. Ind. Hort. Soc.* for 1880.

TIMBER PLANTING IN OHIO; Ohio Agricultural Rept. for 1880.

LANDSCAPE GARDENING FOR THE CEMETERY; read before the Mich. Hort. Soc., December 7th, 1880.

RURAL CEMETERY AND LANDSCAPE GARDENING; *Trans. Ohio Hort. Soc.* for 1880–81.

THE WESTERN CATALPA; *Jour. Amer. Agr. Assoc.,* 1881, pp. 79–102.

WIND BREAKS, SHELTER BELTS, AND SHELTER HEDGES; *Proc. Mont. Co.* (O.) *Hort. Soc.,* 1881, pp. 44–48.

PROTECTION TO THE ORCHARD; read before the American Pomological Society, September 14th, 1881.

WHAT ARE FOREST TREES; *Kans. Hort. Rept.* for 1881.

WOODY PLANTS OF OHIO; *Ohio Agr. Rept.* for 1881.

STREET TREES FOR PRAIRIE TOWNS; *Trans. Ills. Hort. Soc.* for 1882.

TREE SEEDS—THEIR GATHERING, PREPARATION, PRESERVATION, PLANTING, AND CULTURE; the (Minn.) *Forest Tree Planters' Manual,* 3rd edition, 1883.

FORESTRY; an extended series of practical papers, published in *Rural New Yorker* for 1882 and 1883.

LARCH-WOOD; *Amer. Jour. Forestry,* p. 11.

LARCH-MERE; *Amer. Jour. Forestry,* p. 54.

THE WILD CHERRY-TREE; *Amer. Jour. Forestry,* p. 289.

TREE PLANTING FOR RAILROADS; *Amer. Jour. Forestry,* p. 361.

MISCELLANY.

The Profits from Planting Black Walnut.—A correspondent of a Kansas City paper gives the following statement:

"Over in Logan Valley in Nebraska, just south of Sioux City, one man had just sold a young Walnut grove which he planted ten years ago. This sale was the first I have heard of, but it is opening the eyes of the people to a source of wealth surer and more profitable than an Arizona silver mine. This Nebraska grove was sold by Col. Van, of St. James, Neb., near Wayne. Dr. R. B. Crawford, of Wayne, who planted forty-seven bushels of Black Walnuts last fall, tells me that Col. Van was paid by Indiana lumbermen $3,000 for his ten-acre grove. It was ten years old. Col. Van bought the land ten years ago for $1.25 an acre. At the end of ten years he sold it for $300 per acre. If he had put his entire farm of 160 acres into Black Walnut ten years ago, it would have sold for $48,000."

The circumstances of this case may be quite exceptional, and the value in part may consist in probable future growth; but, making large deductions to bring the values down to what would be the general average throughout the country, there will remain a broad margin for profits, to those who wish to make a permanent investment, at a liberal rate of interest, and who are willing to wait for the crop to mature and acquire its full value.

To those who are impatient for returns, and who hesitate about engaging in tree-planting "because they can not live to see the trees at full size—and can never enjoy the profits of their growth"—it can not be too often urged, that a piece of land, properly planted, is worth as much more after the trees are started, as it was before, *plus* the cost of planting; and that the land will always sell for what it is worth, *including the value of the trees*, whenever the owner may wish to sell it.

There is not a person now in middle life, or at a more advanced age, a native of the country, and acquainted with rural life, who can not remember the time when trees, now of majestic size, and groves fit for cutting, as fuel or mill-logs, were very small in the days of their youth, and who, in returning after many years of absence, can scarcely express their admiration at the changes which this lapse of time has made in tree-growth.

When these facts come to be realized, throughout the country, among the owners of the land, we trust that planting will become a favorite mode of investment, wherever there is an opportunity. It can not well be overdone, because the supplies are diminishing, while the demand is increasing every year. The effect will be, to increase the prices of timber, so that, by the time that these trees are ripe for the market, they can not fail to bring a price much beyond that for which they would now sell.

Wood Distillation.—It is only in recent years, that the volatile products obtained by condensing the vapors raised in the process of charcoal burning have been turned to profit in the United States. The demand for wood-alcohol for the manufacture of paints, varnishes, analine, and other articles of general use, and for the acetates prepared from the residue after distillation, which are in demand as mordants for dyeing, and as agents in the manufacture of white lead, and other valuable uses, is at length beginning to attract the attention that it deserves. Undoubtedly such commodities could, if too extensively produced, in a little while, reach the limit of the demand, and result in the depreciation incident to an overstocked market; but when we consider the vast and varied range of uses to which these articles can be applied, and remember that new discoveries in the arts are constantly tending to increase the list, there is still much encouragement for the perfecting of methods, and for the economizing of cost, so as to still keep within the limits of judicious operation, with a reasonable margin for profit.

There are several patents for the condensing and manufacture of the volatile products resulting from the combustion of the hard-woods in closed chambers; but, for the present, we will mention only one of these, in describing an establishment connected with the furnace of the "Gere Iron and Mining Company," at Port Leyden, N. Y. This furnace is run upon charcoal; and, when in full operation, turns out about fifty tons of iron per diem. The average consumption is 2,400 pounds of charcoal to a gross ton of iron made. The chemical department is constructed in part, at least, under the Mathieu patent, and is described in a recent edition of the History of Lewis County, N. Y., as follows:

"Seasoned hard woods (Beech, Birch, Maple, etc.) are brought to the furnace in cord-wood form, and cut and split as for stove-wood. A series of 24 strong egg-shaped retorts, made of boiler-plate iron, is arranged in pairs, and upright, along a structure in masonry, so that they can be filled from above, and the charge may be withdrawn from below. Each retort will hold a cord of stove wood, and they are firmly closed and secured, both above and below—for the pressure within them, in the process of carbonization, is very great.

"The heat needed for this purpose is derived from the gases of the furnace, which are brought in pipes, and the flame is made to circulate around the retorts heating them to the degree required for the disengagement of all volatile products, which requires from twelve to fourteen hours. These are condensed in pipes placed in cold water, and the completion of the process is judged by the character of the smoke that is allowed to escape from a small hole provided for the purpose. The lower end of the retort is then opened, and the contents, still glowing hot, are dropped into a great iron-plate drum, to which a cover is at once applied, and luted air-tight.

"It is then allowed to cool, which requires about as much longer time; but as all the air is excluded, there can be no combustion. These iron coolers are mounted upon an iron railway; and, when cooled, the coal is at once used in the furnace, it being best when entirely fresh. The yield of charcoal is said to be about 60 bushels to a cord—an amount much greater than where a part of the substance of the wood is wasted in burning, as in common coal-pits. The coal weighs from 19 to 20 pounds to the bushel. The wood is cut in winter, and seasoned six to eight months before using, and the wood costs about $3 per cord.

"We will now attempt to describe

the processes of obtaining the products of value, from the volatile portions of the wood: A portion will not condense, but remains as vapor. These gases have inflammable properties, that are turned to account by being passed into the flames circulating around the retorts. They give a steady white flame, and aid considerably in the process. By special arrangements, illuminating gases of the very best quality, are now made from wood, but these gases do not afford a flame suitable for this purpose as they come from the condensers, and illuminating gas is not made at this place.

"The watery products obtained from the condensed smoke, are much the same as we get in 'leaking chimneys'—that is to say, in places where the smoke of our stoves and furnaces (using wood) gets nearly cold before it leaves the chimney, and condenses in 'soot-water,' to the infinite annoyance of house-keepers. This liquor is first distilled to separate the wood-alcohol, which, by two or three other distillations, is reduced to a clear or slightly brown liquor, of a specific gravity of about 0.85, and an intensely pungent taste. It is very volatile, inflammable, and applicable to all uses for which alcohol from grain is employed—*except for drinking.* The quantity got, is said to be five gallons to the cord of wood, worth some 75 to 80 cents per gallon. It is sent off in kerosene barrels, and must be closely confined to prevent waste.

"The waters remaining after distillation, which are chiefly dilute acetic acid, are then saturated either with quick-lime, or with litharge—the former making the 'acetate of lime,' and the latter the 'brown acetate of lead.' It is then evaporated down to dryness, when it is ready for market.

"The 'acetate of lime' is worth some $40 to $50 per ton, and is a black earthy substance, soluble, but not liable to change in the air, and may be sent off in bags. It is used in the manufacture of white lead. * * * The product heretofore made here, has been chiefly the 'brown acetate of lead,' a dark brown substance, looking something like maple sugar, and, when broken, presenting a crystalline structure. * * * About 300 pounds are made from the smoke of a cord of wood. * * * We have not mentioned another product, which is *tar*, of which no use is made. It is proposed to use it by mixing it with charcoal dust, and thus form blocks that may be used as fuel."

"*Terra-Cotta Lumber.*"—This material of which notices have been circulated by the press—and of which, perhaps, statements have been made beyond what the inventors would claim, is made as follows:

A kind of unctuous clay (such as is taken from above the fire-clay stratum, near Perth Amboy, N. J.) is mixed with sawdust, in about even parts, more or less according to quality desired, and it is then pressed into blocks, something after the manner of pressed bricks. These blocks, when dried, are baked in kilns, by which process the saw-dust is burned out, leaving a light spongy mass, of considerable strength, which may be sawed and cut. Being fire-proof, and a slow conductor of heat, it finds use wherever these qualities are desired. From its spongy structure, it holds mortar when applied, without the need of lath. It may be used for filters, fire-linings, sheathing of steam-pipes and boilers and many other uses, but does not appear to be suitable for out-door exposure, unless saturated with some substance that would exclude the water.

To the lumberman it affords a means of disposing of his saw-dust, but probably not above the cost of its transportation from the mill, and only from favored localities at that.

Forestry in Australia.—The colonies of Australia are awakening to the importance of Forest conservation and restoration, and South Australia is the first to establish a system of Forestry, that promises good results. Legislation upon this subject, was begun in 1871, when Mr. Krichauff, M. P., called for a return, eliciting information from persons resident in the different districts of the colony, in regard to the supply, preservation, and culture of Forests. The answers were summarized and prepared by Dr. Schomburgk, Director of the Botanical Gardens at Adelaide. In 1873 he introduced a bill, and secured its passage. It was entitled "An act to encourage the planting of Forest Trees," and provided for the payment of £2 per acre for every acre planted by a land-owner in certain districts of the colony, upon certain conditions specified. A report on Forest Reserves was submitted during the same session, prepared for the Hon. the Commissioner of Crown Lands, by G. W. Goyder, Esq., the Surveyor-General, in which it was suggested, that certain portions of the country should be set apart by proclamation as Forest Reserves, and the subject of the formation of a Department of Forests, was discussed at length.

In 1875, a bill was brought in by Mr. Krichauff, and passed, entitled "An Act to make provision for the appointment of a Forest Board, and for other purposes." It defined the districts pointed out as proper for Forest Reserves, in the previous report of Mr. Goyder, and specified the duties of the Board. It did not, however, survive long enough to test its merits, and was superceded, in October, 1878, by the "Forest Trees Act," and this again by "The Woods and Forests Act of 1882," which has been passed during the current year.

A cumbersome arrangement under the Forest Board having failed to meet the requirements, the three non-official members resigned; upon which the Government, considering that the operations of the system could be better conducted by the Conservator of Forests, placed directly under the "Honorable the Commissioner of Crown Lands and Forests," this mode of management is now in operation.

The principal fault of the system appears to consist in the smallness of means provided, amounting, we believe, to about £5,000 per annum. This, when applied to the expenses of office management, and to the care of something like 240,000 acres, of which two-thirds are timberless, or covered with a useless growth of dwarf Eucalypti, Acacias, and the like, should not raise great expectations of grand results.

From the official report for 1881–2, it appears that there were then 19 Forest Reserves, containing 239,336 acres, which, with the exception of the Traveling Stock Reserves, were all leased for pasturage purposes at rates ranging from ½*d*, to 2*s*. 8*d*. per acre. There were four well established nurseries, having together an area of about 20 acres. Planting, and other forest conservancy operations, were being conducted upon 8 Reserves. The force consisted of 3 foresters and 4 nurserymen, with an average force of 25 laborers. About 4,043 acres had been inclosed and set apart for planting and other forest operations. The average income from the Forest Reserves, in the last six years, had been £5,581, and the expenditures of the Board, £5,787. About 440,000 young trees were doing well, from the results of the Board's planting; some 300,000 saplings and seedlings of natural growth had been pruned, in connection with the system of encouragement for the renovation of the indigenous forests, and about 50,000 seedlings of natural growth had been reared in the Natural Regeneration inclosures.

The following extract from regulations, dated January 13th, 1879, and applicable to the Wirrabara Reserve, will prove of interest to our readers:

1. All standing trees disposed of by the Forest Board in this reserve, by private contract or otherwise, must be previously marked by the Conservator or officer in charge.

2. The official mark will consist of a longitudinal chip taken off two opposite sides of the tree and stamped F.B. in distinct characters.

3. Each tree must be cut off from its base at a height not greater than two feet from the ground.

4. In cutting down trees, care must always be taken to fell them in such a manner that they will not interfere with or injure any of the other trees, saplings, or seedlings, left standing on the ground; and should any damage arise in this way from the carelessness of the workmen, the officer in charge of the reserve (whose decision on such matters shall be final) is empowered to value such damage at a rate equal to the deterioration effected, and collect the amount from the party to whom the tree felled has been sold.

5. Any party or parties found felling trees which have not been marked and sold to them, will incur a penalty of not more than five pounds, in addition to the value of the material.

6. No purchaser shall be permitted, on any pretense whatever, to light fires within the forest, except on such sites and for such special purposes as shall be defined by written permission from the Conservator.

7. The purchaser of any tree must remove the whole of the same that is convertible into a marketable commodity, and pile together all refuse ready for burning, to the satisfaction of the forest officer. Any breach of the two last regulations, will incur dismissal from the forest.

8. Purchasers will be allowed sufficient time for the removal of their timber from the forest. This time will in all cases be specified and entered in the forest sales-book. Should any purchaser fail in having it removed within the period stated, then it will be optional for the officer in charge to declare it forfeited or give an extension of time for its removal.

9. Splitters applying for timber, on satisfying the Conservator of their respectability, and on giving a guarantee that they will not attempt to evade the regulations, will be allowed to erect temporary huts on such sites as the Conservator shall deem expedient; but they will not be allowed to keep stock of any kind in the forest further than may be necessary at certain times for the removal of their timber to market—this to be decided by the Conservator, whose decision shall be final.

10. All standing timber will be sold per cubic foot, or in lots by valuation, to suit purchasers.

11. As soon as the trees are marked and sold, they will be at the entire risk of the purchaser; but the purchaser will not be allowed to cut or ring trees bought, until a proper settlement for the same be made to the satisfaction of the forest officer.

12. All sales amounting to less than £2 to be paid for in full before the timber is interfered with; and all sales realizing more than that amount, the purchaser shall pay half

such sum in advance, the remainder before any of the timber is removed from the ground.

13. Sites for the erection of saw mills will be granted on payment of a nominal charge per annum, and licences given for materials, sinking wells, erection of huts, and stabling for accommodation of horses used in the haulage of timber. Special arrangements for the purchase of timber will be entered into with parties erecting saw mills.

14. Sites for the erection of saw-pits will be granted free of charge, with liberty to erect temporary camps and depasture working bullocks actually employed in the hauling of timber, etc.; all subject to approval of the Conservator.

15. Licenses to split posts and rails from dead wood in localities named in body of licenses, will be granted at 20s. per anuum each, with an additional fee of 10s. per 100 for all posts and rails removed from the forest.

16. Licenses to procure straining or corner posts of dead timber from localities to be named in license, will be granted at 1s. for each post.

17. Licenses to remove firewood from the dead timber lying upon the ground from localities to be named in body of license, will be granted at the following rates:—

1s., for one horse load;

1s. 6d., for load of two horses or bullocks;

2s. for load of four horses or bullock;

4s. per load where more than four horses or bullocks are used.

Stone, sand and gravel.

18. Licences to remove stone, sand, and gravel, will be granted at 20s. per month each.

19. Splitters will be allowed to erect temporary huts only in the forest, and only on such sites as may be approved by the Conservator.

New regulations dated March 20, 1883, and received too late for further notice in this number, have been issued under the Woods and Forests Act of 1882. They vest in the Conservator of Forests, their immediate control and management, the sale of timber, employment of laborers, etc., but subject to the approval of the Commissioner of Forest Lands.

These regulations forbid the lighting of fires for any occasion during the summer months (May to October), and provide for the sale of licenses for various purposes, besides the cutting of timber.

The Eucalyptus, and its Evaporating Power.—In a Parliamentary paper relating to Natal (1878–9, vol. 50, p. 8), we find the following statement:

"Clumps of Eucalyptus planted in undrained swamp lands, at elevations up to 4,000 feet, have been known to completely dry up the space within reach of their roots. The growth of timber in these situations is computed at twelve tons per acre per annum, while the annual growth of the vegetation, which it superceded, did not exceed one and a half tons per acre per annum."

Improvements in Wood-bending.—The process of steam-bending has made remarkable progress in recent years, and is now carried on with comparatively little loss or waste. This success is obtained by up-setting the inner portions, instead of stretching the outer ones. The ends are firmly secured by clamps so that there can be no slipping, and the wood, softened by steam, is brought to place upon the mold. In this process, since the external part can not stretch, the internal, must be compressed, and the fibres are corrugated—perhaps not enough to be observed by the eye—along the whole length of the curve.

Economies in Forest Work.—Where forestry is studied with strict economy, the saw is preferred to the ax, as well in felling as in working up, for the manifest reason that it saves material.

Where timber is felled among other trees reserved, it is customary to lop off the branches, so as to injure other trees as little as possible in falling.

Where timber is cut on a hillside, it should be made to fall towards the hill, as being less liable to break in falling. If on a plain, it will season sooner if felled towards the north, as exposing the timber to the direct rays of the sun.

Distribution of Seeds by means of Irrigating Canals.—In portions of India that are watered by irrigating canals, a method of seeding has been proposed, by causing the seeds to be carried in the water, and lodging wherever there might be an opportunity for them to germinate, upon the land that was flowed.

This is one of the means by which nature operates in distributing the seeds of trees and plants along the course of rivers and streams. It may often happen that the united weight of the seeds with their pods or capsales may be lighter than water, while the seeds if detached would sink.

BIBLIOGRAPHICAL NOTICES.

French Forest Ordinance of 1669; *with Historical Sketch of Previous Treatment of Forests in France.* Compiled and translated by JOHN CROUMBIE BROWN, LL.D., Edinburgh, 1883. 12mo, p 180.

This little volume adds one more to the list already noticed in this JOURNAL, from the pen of one of the most industrious writers upon Forestry in the English language, and is but one of the series now in course of preparation, having reference to the history and condition of Forest science in Europe.

The memorable ordinance of 1669, was the first general system of intelligent Forest management in France, and remained in force (with some modifications), until the adoption of the present "Code Forestière" in 1827. The jurisprudence and the ordinances resulting from the administration of this act of 1669, led to the publication of several elaborate editions, one of which, now before us, fills two large and closely printed quarto volumes.*

The translation now issued by Dr. Brown is from an edition printed in 1753, and is preceded by a notice of the earlier history of Forest Management and Legislation in France, and of the abuses that had crept into the administration, until injuries had been done almost beyond the power of man to restore, and by those whom none but a strong government could punish.

Until swept away by the innovations brought in by the French Revolution, the government, under this ordinance, assumed to control the action of private owners in the management of their own woodlands, by forbidding any clearings under a fixed age, and by requiring that a certain number of trees should be reserved in cutting coppice woods, until they had grown to their full maturity. The government reserved the first right of purchase, for the supply of its arsenals and ship-yards, and might take, upon an appraisal, from the timber growing upon private lands, whatever suited its purpose, and wherever found.

The little volume now issued, will prove of interest to all persons who wish to trace the origin and growth of Forestry as a matter of government concern in France; and in the provisions which this ancient code contains, they will find not a few that might, with proper modifications as to penalties, be profitably grafted upon our statute laws of the present day. The restriction upon the use of fire, may be taken as an example:

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* "Conference de l'ordonnance de Louis XIV. du Mois d'Août, 1669. Paris, 1752, pp. 928 and 860."

"32. We make it also forbidden to all persons to convey or kindle fire at any time or season whatsoever in our forests, heaths, or shrubberies, and those of communities or of private proprietors, under pain of corporal punishment, and of arbitrary fine, besides the reparation of any damages which the fire may have caused, for which the communities and others who have selected the grounds shall be reponsible to the civil law."

The code of 1669 assumed the control of inland waters in relation to navigation, flotage, the rights of fishing, passage, pontage, and other matters concerning these waters and their use. From this has arisen that association of the term "*Eaux et Forêts*" (Waters and Forests), that we are still continually meeting with, although no longer in legal force.

Dr. Brown, in his announcement, informs us that he has in preparation a similar volume on the Modern Forest Economy of France; and in a recent letter he writes, that he has made arrangements for sending, by post, any of the books that he has published, at their retail prices. His residence and address is at Haddington, Scotland, and any persons who may wish to receive his circulars and catalogues can very readily obtain, by applying to him, all the information they may desire. He pledges himself that the whole proceeds of sales shall be spent in the publication of other works on Forestry, for which there is no such demand as would warrant a publisher to issue them at his own risk.

Report on the Necessity of Preserving and Planting Forests. Compiled at the intance of the Government of Ontario. By R. W. PHIPPS, Toronto, 1883. pp. 138.

We have been aware for some months, that a work was in course of preparation by Mr. Phipps, having for its object the diffusions of information upon the subject of Forestry. With the result before us, it appears to have been intended to present the subject "in so popular a form as to ensure its being generally read, and thereby to enlist the understanding and sympathies of all in the valuable work contemplated—that of preserving such portions of forest as are necessary for our future supplies of timber, and for that still more important result, which the maintenance of forests secures—the great climatic and agricultural benefit derived from regular supplies of moisture, whether in river, spring or rain-fall."

In glancing over this publication, it appears that the author has been a diligent student of his subject, and we think he has succeeded in presenting it in an attractive form. He quotes liberally from well known authorities in support of principles in meteorology and hydraulics, which can no longer be regarded as doubtful facts. They can not be too widely known, and it is only by repeated and persistent efforts like this, that we can ever hope to secure that attention to the maintenance of a proper area of wood-lands, which will alone prevent the injuries which other countries have experienced from their loss.

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UPON THE PROFITS OF FOREST CULTURE.

By the Editor of the American Journal of Forestry.

(Continued from page 510.)

UPON the whole, to those thoroughly prepared by special education, this presents an inviting field of enterprise, and the history of our country presents an abundance of instances of notable success, as well as of complete failure. It invites the keenest observation, for the discovery of improvod methods, whereby materials or labor may be saved, or the products improved—but on the whole, it does not invite the investment of money by those who must depend upon others for its management. There are projects arising that promise extraordinary profits upon their capital stock,—but of these, as of mining operations that promise enormous dividends, it may be asked,—"why do not the owners of these rich opportunities, reap the profits themselves?" They remind us of the man who having found, as he claimed, the "philosopher's stone," sought a great reward from his sovereign. He received an ample but empty silken purse, with the reply,—"since you know how to make gold, you need only a purse to put it in."

3. *Commerce and Inland Transportation.*—Vast sums of money have been expended upon these objects with widely varying success. Although our rivers, lakes, and canals afford

opportunities for the investment of small amounts of capital, under individual ownership, and the high-seas other more varied, and more or less inviting fields for enterprise, the carrying trade of the interior, has, in recent years, fallen almost wholly under the control of great railroad corporations, absorbing vast sums in construction and management, and effectually monopolizing the business that they serve.

They have, in a great degree, superceded the traffic and travel upon our inland waters; and, although checked now and then by the competition of rival lines, the tendency has steadily been toward centralization and consolidation—too often without regard to local interests or private rights.

The surplus money of the country has probably sought investment in these enterprises much more extensively than in any other. They amount to many billions of dollars, and the sum total is increasing more and more every year. The quotations of the Stock-exchange show how these values have fluctuated, and with that uncertainty a blind investment may be doubled or lost by a turn in the financial market. Were these changes always due to the varying conditions of supply and demand, in the commodities that are transported, or in the business done, something might be judged beforehand, as to the actual values of railroad property, and of the securities based upon it; but we oftener find these fluctuations due to interested misrepresentations, and to rumors favorable or adverse, as those who start them, may wish to sell or to buy.

In all of these forms of investment, we find the operating expenses large, and production ceases the moment that labor stops. In all of them the heaviest expenses must all be incurred at first, before any receipts, and for the most part alike, whether the enterprise proves a success or a failure.

4. *Agricultural Industries.*—We will include under this head all farming and gardening operations, fruit-culture, stock-raising, and the production of all animal and vegetable commodities that afford an article of sale or use. The amount and profit of returns in these forms of business depend upon many conditions, such as soil, climate, distance from market, cost of labor, etc., and there is a certain expense necessary to cover the losses from depreciation and decay. Buildings and

fences will need repairs, and occasionally renewal—the soil needs fertilizers—and tools and machines, as well as animals kept for labor, are growing old, and need to be replaced from time to time. We have casualties of various kinds to expect, and against some of these it is impossible to provide. Upon the whole, however, this mode of investment, to the man who gives it his personal attention, and who manages with intelligence, affords not a large, but a sure return for his capital, and reward for his labor. We have in every rural neighborhood, examples of success and models of management worthy of imitation; yet this success is only got by a continually recurring round of labor, and the estate is generally worth no more one year than the year before, unless from seasonable improvements and thoughtful care.

Excepting in pioneer settlements, the cost of agricultural investment is usually dependent upon the quality of the land, the condition of the improvements, and the distance from markets. These are liable to but slight fluctuations in value, and, after the location of railroads and business points in a country, they present little inducement for speculation. It may, of course, be increased by careful management, and this, if generally practiced, tends to promote the prosperity of the region where located. As a means of investment, farming presents no opportunities to the money-lender, beyond the chances of a loan to new beginners, or in turns in affairs, which, in prosperous times, are becoming every year less. It is extremely rare that a farmer admits a partnership in his business, and in this industry we find verified the wise maxim so often quoted from "Poor Richard," that—

> "He who by the plow would thrive,
> Himself must either hold or drive."

5. *Forest culture.*—We have already, in the beginning of this article, enumerated the principal elements of cost, and the chief conditions of success. As a matter of investment, the growth of timber has hitherto attracted but little notice; for, although planting has been done by a very great number, it has been generally in but a limited way, and for personal supply. It has been practiced extensively in various parts of

Europe, in situations where it was found more profitable than any other form of cultivation could have produced. With us, planting has been found most advantageous in our prairie regions, and along the eastern border of our great plains, which, when first opened for settlement, were but poorly supplied with native woodlands, along the borders of the streams, or were wholly destitute of timber trees of any kind.

Here the want of wood as a material is one of the very first that is felt by the settler, and it is found no difficult matter, within ten or a dozen years, to produce a supply sufficient for the local wants, excepting for building purposes, without noticeable expense. Hitherto, these plantations have been scarcely more than enough to meet this demand, and, for all commercial and industrial purposes, we rely chiefly upon the native woodlands and timber of spontaneous growth.

Can this culture be made an inviting field for pecuniary investment upon the large scale? If so, under what circumstances can it be done to best advantage? These are the first questions that the financier will ask, and, unless they can be satisfactorily answered, he will run no risks.

At present prices, and upon highly fertile and easily cultivated soils, there can be no doubt but that the grains and grasses yield a more profitable return. A time might come when the prices of timber would invite the cultivation of forest trees in the best of soil; and it is quite certain that their growth in such locations is proportionally more rapid. But, for the present, we will admit, that the preference must generally be given in the best lands to agriculture, and must seek for places less productive under common tillage, that may still prove entirely suited for forest culture—that may, in fact, be good for nothing else. However broken and stony the surface may be, if there is soil enough for the roots of trees, they will grow equally well as where it is entirely smooth and clear of stones. There may, in fact, exist a diversity of surface and aspect that favor different species, and it is well known in Forestry that a mixture of different kinds of trees may yield a greater profit than where it is all of one kind. We have an instance of this in the Oak and the Beech; the former sending down its roots deep, while those of the latter spread out near the surface. The Pines and the Oaks grow well together when young, and the former afford excellent nurses for the latter when young, but should be thinned out as the more valuable kind needs more air and light.

It is, in fact, this property of drawing its nourishment from a greater depth than the roots of grain can reach, that renders forest-culture profitable in some places where the surface-soil is barren. We often find a growth of Pine that is truly magnificent upon a sandy soil hardly worth owning when it is once cut off, and the term "Pine plains," or "Pine barrens," conveys to the mind the idea of a sandy region that is scarcely adapted to grain of any kind, and upon which a strong grass sod can not be maintained. These plains are often underlaid by a clay, not below the reach of the roots of trees, and that may afford the elements for their most vigorous growth. Besides this, in stony and rocky districts, where the soil is lodged in fissures, the fibers of the roots may not only insinuate themselves into the thinnest crevice, but, by their expansion, they may hasten in no small degree the disintegra- of shaly rock, and, by their decay, they may leave openings into which water may penetrate, and sometimes thus hasten the process of its reduction to soil.

There are everywhere waste places that do not admit of plowing, and that are worth but little for pasturage—that are, in fact, lying idle and unproductive, which, if properly planted, would be gradually producing what might, at its maturity, be worth much more than the cost of starting and the interest upon this investment. It is, therefore, worthy of inquiry as to whether the value of landed estates may not be enhanced, without seriously diminishing their present returns, and without much expense.

Aside from the incidental effects in the improvement of waste places—the renewal of fertility in exhausted soils, the maintenance of water supply, shelter from winds, and other advantages—the profits from timber culture may, even at present prices, yield a reasonably fair, and, in some cases, a very liberal, return. The investment for extensive planting can only be undertaken by those who can wait for the growth of trees, which seldom is less than twenty, and may be several times twenty years, in reaching maturity; but when this time comes, the aggregate returns will be found to compare favorably with those of agriculture for a like period. In fact, instances were mentioned in the sessions of our Forestry Congress, showing that, in some cases, they exceed those of any but the most intensive cultivation.

When we take into the estimate the benefits to be gained by forest-culture in places where this alone is possible—restoration of worn-out lands secured by this means, the comparative certainty of the result, the relatively small amount of labor that it requires, and the direct and indirect benefits from material grown, and effects produced—we must admit that it presents, at the present time, in certain cases, an inviting field for investment, and, in some instances, an alternative between a less promising, but still certain, profit on the one hand, and of absolutely nothing on the other.

PROCEEDINGS OF THE AMERICAN FORESTRY CONGRESS,

[At its Session, held in the Hall of the House of Representatives, at the State Capitol, in the City of Saint Paul, Minn., August 8–9th, 1883.]

THE hour of 2 o'clock P. M., August 8th, had been appointed and advertised for the meeting; but a wish having been expressed by its President for an earlier commencement, to enable him to meet other engagements, the meeting was called to order by the Hon. **Geo. B. Loring**, President of the Congress, at 10 o'clock A. M.

Upon motion of F. P. **Baker**, of Kansas, a resolution was passed for the appointment of a committee upon the Order of Business, to consist of three persons appointed by the chair.

Mr. F. P. **Baker**, Mr. G. W. **Minier**, and Mr. H. G. **Joly**, were appointed as this committee.

Mr. H. G. **Joly** moved a resolution, which was adopted, as follows:

"*Resolved*, That a committee be appointed with instructions to draft resolutions concerning the great loss suffered by the

American Forestry Congress by the death of Dr. J. A. Warder, one of its Vice-Presidents, since its last meeting."

The chair appointed Mr. H. G. Joly, Dr. F. B. Hough, and Rev. N. H. Egleston, as this committee.

Upon motion of Rev. N. H. Egleston, a resolution was offered, expressing the regrets of the Congress upon the death of the Hon. Leonard B. Hodges, of Saint Paul; and upon motion of Mr. G. W. Minier, the name of the late Arthur Bryant, Sen., of Princeton, Ill., was included. It being suggested that there might be other names worthy of mention, the resolution was further amended and passed, instructing the committee above named, to include such as they might deem worthy, and instructing the Secretary to transmit certified copies of these resolutions to the families of the deceased persons.

Mr. R. W. Furnas, of Nebraska, offered the following resolution:

Resolved, That Article VI of the Constitution be amended by inserting the word "President," so that it should read as follows:

"Art. VI. The President, Vice-Presidents, Secretaries, and Treasurer, shall constitute an Executive Committee, for the transaction of such business as may be required by the Constitution, or by a vote of the Congress."

This resolution having been adopted, another was offered by Mr. Furnas, to further amend by striking out the words "the close of," from Article XII of the Constitution, so that it should read as follows:

"Art. XII. At each annual meeting there shall be an election of officers for the ensuing year," etc.

This being adopted, Mr. J. S. Hicks of New York, moved a resolution directing the appointment of five persons to serve as an Executive Committee—which was adopted.

Mr. J. G. Knapp, of Florida, offered a resolution for the appointment of a temporary Treasurer, in the absence of Dr. Charles Mohr, the Treasurer, which was adopted, and Mr. J. Fletcher Williams, of Saint Paul, was appointed.

Mr. R. W. Furnas offered a resolution, which was adopted, directing the President to appoint a committee of three upon

Organization; whereupon Mr. FURNAS, of Nebraska; Mr. B. G. NORTHROP, of Connecticut, and Mr. J. H. MORGAN, of Ontario, were appointed.

Mr. BAKER, from the committee on Order of Business, reported the following rules for the present session, which were adopted:

"1. That until all work be disposed of, the Forestry Congress meet every day at 10 in the forenoon, 2 in the afternoon, and 7:30 in the evening.

"2. That all the papers prepared by members present, be read according to the alphabetical order of the writers' names.

"3. That the titles of the papers sent by absent members be read, and that on motion of any member, the Congress will decide whether such paper be read at length or not.

"4. After the reading of each paper, the subject matter will be open to discussion, no member being permitted to occupy the attention of the Congress more than ten minutes.

"5. That privilege be granted to this committee to make any further report, should it be deemed necessary."

Upon motion, offered by the Rev. N. H. EGLESTON, and adopted, the chair was directed to appoint a committee to report upon the best methods of Tree Planting; whereupon the Rev. N. H. EGLESTON, of D. C.; Mr. GEO. W. WRIGHT, of Iowa, and Prof. W. B. LAZENBY, of Ohio, were appointed.

The following-named persons were then elected members of the Forestry Congress, upon recommendation of two members, viz.:

J. H. MORGAN, of Amherstburg, Ontario.
EDWARD DANIELS (Curator Acad. Science), of St. Paul, Minn.
B. G. NORTHROP, of Clinton, Conn.
GEO. H. WRIGHT,[1] of Sioux City, Iowa.
J. FLETCHER WILLIAMS, of Saint Paul, Minn.
F. P. BAKER, of Topeka, Kansas.
WARREN HIGLEY, of Cincinnati, Ohio.
WM. R. MARSHALL, of Saint Paul, Minn.
DR. J. H. BRYANT, of Saint Paul, Minn.
EUGENE SEEGER, of Saint Paul, Minn.

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[1] This entry appears to have been made through inadvertence, as Mr. Wright was a member of the former "American Forestry Association," and for this reason entitled to membership in the Forestry Congress.—*Editor.*

FERDINAND HARRSEN, of Saint Paul, Minn.

J. L. BUDD, of Ames, Iowa.

The hour of 12 Meridian having arrived, the Congress took a recess until 2 o'clock P. M.

Afternoon Session, August 8th.

The hour of 2 o'clock having arrived, the President took the chair, and announced the presence of Gen. GEORGE L. BECKER, of Saint Paul, President of the Minnesota State Forestry Association, who addressed the Congress with a speech of welcome, on behalf of the Association, and introduced His Excellency Governor L. F. HUBBARD, who welcomed the Congress on behalf of the State.

His Honor C. D. O'BRIEN, Mayor of Saint Paul, being introduced, welcomed the members of the Congress to the freedom of the city, in an appropriate address.

At the conclusion of these proceedings, President LORING delivered his Annual Address.

Mr. JOLY, from the committee appointed upon resolutions concerning deceased members, then offered the following resolutions:

"*Resolved*, That the American Forestry Congress has suffered an irrepairable loss by the untimely death of one of its Vice-Presidents, Dr. J. A. WARDER.

"*Resolved*, That while Dr. WARDER has endeared himself, by his genial and hearty manners, to all those who have had the privilege of knowing him personally, he has, at the same time gained their admiration by the untiring energy and great talent with which he has advocated for so many years past, the cause of Forestry.

"*Resolved*, That the loss of such an earnest and devoted man can be considered as a public loss, and that, while his colleagues lament it as such, they feel, at the same time, what a void it must have left in his home circle, and deeply sympathize with his family.

"*Resolved*, That the Recording Secretary of the Forestry Congress be requested to send a copy of the foregoing resolutions to Dr. WARDER's family."

Also the following resolutions, from the same committee:

"*Resolved*, That the Forestry Congress desires to express its sense of loss on the death of Hon. L. B. HODGES, of this city. Mr. HODGES had been known for many years, not only as one greatly interested in the subject of Forestry, but as one who, by his earnest activity, had done much to interest others in the subject. He was the pioneer in the Forestry movement in the State of Minnesota. He was also one of the first to propose and aid in the organization of the Minnesota Forestry Association. By his writings, and his practical exemplifications of tree planting, he had become a recognized authority on the subject both in this country and in Europe. His death was a loss to the country at large, but his labors in behalf of Forestry will speak for him, and bear good fruit, after his personal labors were brought to an end.

"*Resolved*, That the Recording Secretary be directed to send a copy of the above resolution to the family of Mr. HODGES."

Also the following resolutions, from the same committee:

"*Resolved*, That this Congress feels it to be a duty it owes to men who, like the late ARTHUR BRYANT, have forethought to discern, and courage to express their convictions on the conservation of our forests,—to express regret for their death, and, while we feel that men of his age have done their work, we nevertheless deplore the vacancy in our ranks.

"*Resolved*, That the Recording Secretary be instructed to send a copy of the above resolution to the family of Mr. ARTHUR BRYANT."

Remarks upon the above resolutions having been made by Mr. GEO. W. MINIER, of Ill.; the Hon. J. B. GRINNELL, of Iowa; Hon. W. HIGLEY, of Ohio; Prof. DANIELS, of Minn.; Ex.-Gov. MARSHALL, of Minn.; Hon. IGNATIUS DONNELLY, of Minn., and Mr. D. W. BEADLE, of Ontario, the resolutions were passed by a rising vote.

Mr. BAKER, from the committee on Order of Business, made the following supplementary report, which was adopted:

"1. That all committees appointed at the Montreal meeting be requested to report at the opening of the morning session, on Thursday.

"2. That immediately after the reports of the above committees, Judge HIGLEY present his report on the State Association of Ohio, and then, that F. B. HOUGH, of New York, make such statement as he desires on the steps which have been taken toward organizing a State Association in that State.

"3. Reports of committees, as presented on page 29 of the proceedings of the Montreal meeting."

Mr. B. G. NORTHROP presented the following resolution, which was adopted:

"*Resolved*, That the U. S. Commissioner of Agriculture be requested to call a meeting of the representatives of associations and institutions interested in Forestry, at the Department of Agriculture, during the ensuing winter."

Dr. HOUGH offered the following resolution, which was adopted:

"*Resolved*, That a committee of three be appointed by the chair to prepare the form of a certificate of membership, and a device for a seal for the American Forestry Congress."

Dr. HOUGH, Prof. LEUÉ, and Prof. NORTHROP, were appointed as this committee.

Mr. ELIZUR WRIGHT, of Mass., presented the following resolution, which was adopted:

"*Resolved*, That a committee of three be appointed by the chair to consider and report upon the probable effects that will ensue, should the plans proposed for damming the Upper Waters of the Mississippi, for the creation of reservoirs, be carried into effect."

Mr. ELIZUR WRIGHT, of Mass.; Gen. GEO. L. BECKER, of Minn., and Hon. J. B. GRINNELL, of Iowa, were appointed.

Mr. Furnas, from the Committee on Organization, reported the following list of officers for the coming year, which report was adopted:

For President, GEO. B. LORING, of Massachusetts.
" *1st Vice-President*, H. G. JOLY, of Quebec.
" *2nd Vice-President*, GEO. L. BECKER, of Minnesota.
" *Recording Sec'y*, N. H. EGLESTON, of Dist. Columbia.
" *Corresponding Sec'y*, B. E. FERNOW, of Pennsylvania.
" *Treasurer*, CHARLES MOHR, of Alabama.

Executive Committee.—B. G. NORTHROP, of Connecticut; WARREN HIGLEY, of Ohio; J. G. KNAPP, of Florida; J. S. HICKS, of New York; J. L. BUDD, of Iowa.

The hour for recess having arrived, Mr. Baker announced the order of business for the evening session, and the Congress adjourned till 7:30 P. M.

EVENING SESSION, AUGUST 8TH.

The hour for meeting having arrived, the President called the house to order, and requested Vice-President JOLY to assume the chair.

Mr. D. C. BURSON, of Topeka, Kan., read the following named paper:

"Forest Tree Planting, as an Investment."

Discussion followed, in which the following persons participated, viz.: Mr. SUEL FOSTER, Prof. NORTHROP, Mr. BURSON, Mr. MINIER, Prof. LAZENBY, Dr. HOUGH, Mr. HICKS, Mr. THAYNE, and Mr. DEAM.

Prof. ADOLPH LEUE, of Cincinnati, O., read the following named paper:

"Forestry Experimental Stations."

Discussion followed, in which the Rev. Mr. EGLESTON, Mr. MINIER, Mr. HIGLEY, Dr. HOUGH, Prof. LAZENBY, Prof. LEUE, Prof. NORTHROP, and Comm'r LORING, participated.

Dr. FRANKLIN B. HOUGH, of Lowville, N. Y., read the following paper:

"Forestry Education."

Discussion followed, in which Mr. FOSTER, Judge HIGLEY, Prof. BUDD, and Mr. MINIER, participated.

The hour for adjournment having arrived, the Congress adjourned until to-morrow, at 9 o'clock A. M.

SECOND DAY, MORNING SESSION, AUGUST 9TH.

The hour for meeting having arrived, the President assumed the chair, and the Congress proceeded with the reading of reports from committees, as previously arranged.

Prof. ADOLPH LEUE, from the committee appointed at the Cincinnati session, in April, 1882, to report upon Forestal Experiment Stations, presented a report, as follows:

REPORT OF THE COMMITTEE ON FORESTAL EXPERIMENT STATIONS.

"In consideration of the existing circumstances of this country, as—

1. The absence of State Forests;
2. The want of trained Foresters;

3. The non-existence of Forest Academies; and,

4. The comparatively little importance which the Legislatures of almost all the States have attached to experimenting in Forestry;—

Your committee most respectfully submits the following:

I. That the members of this Association individually urge, in their respective States, the necessity of establishing Experiment Stations.

II. That this Association, as a body, or through a committee, memorialize the General Assemblies of their respective States, and in this memorial urge upon these bodies the need of such stations, and the practicability of establishing them in various places in each State.

III. That the Ohio plan of organizing such stations, on account of its being exceedingly practicable and thorough, be recommended as the most suitable to our circumstances.

IV. That the Forestal Experiment Station, consisting, as it does in Ohio, of a center, of primary and secondary stations, may center most appropriately in the Agricultural Colleges.

V. That a standing committee on Forestal Experiment Stations be appointed for the ensuing year.

(Signed), Adolph Leue, Chairman,
Franklin B. Hough."

Upon motion of Prof. R. B. Warder, the above report was accepted and adopted.

Upon motion of Mr. J. H. Morgan, the Congress resolved that the memorial provided for in the report be also addressed to the Governments of the Dominion and the Provinces of Canada.

The Chair appointed Prof. A. Leue, Mr. J. H. Morgan, and the Rev. N. H. Egleston, as such committee.

It was further ordered that a committee upon Forestal Experiment Stations be appointed, and the following persons were named as this committee, viz: Rev. N. H. Egleston, Mr. R. W. Furnas, Prof. Wm. Saunders, Mr. Leo Weltz, Mr. Warren Higley, Prof. R. B. Warder, and Prof. Adolph Leue.

Dr. Franklin B. Hough, from the committee appointed at the Cincinnati session, in April, 1882, to memorialize State Legislatures upon the establishment of State Forestry Commissions, presented a report, as follows:

REPORT UPON THE ESTABLISHMENT OF STATE FORESTRY COMMISSIONS.

The undersigned, being members of the American Forestry Congress, appointed to prepare a memorial upon the establishment of State Forestry Commissions, having consulted as opportunity offered, would respectfully recommend the following draft of a communication, which, if approved by the Congress now in session, might be addressed to the Governors of the several States (and with proper change in the direction, to the Governments of Canada), with the request that the same be transmitted to their respective Legislatures for consideration.

FRANKLIN B. HOUGH, Chairman,
WILLIAM R. LAZENBY.

To His Excellency, the Governor of

SIR:—The American Forestry Congress, having, by a committee of its members, prepared a memorial to the Legislatures of the several States of the American Union, and to the Provincial Parliaments of Canada, upon the subject of establishing State and Provincial Forestry Commissions, adopted the same, after due deliberation, at its session held in the city of St. Paul, Minn., on the 9th day of August, 1883, and as to the former, requested the Commissioner of Agriculture to transmit the same to the Governors of the several States, with the request that it might be referred to their respective Legislatures for consideration.

The inclosed communication is addressed to you in pursuance of this intention, with the request that, if approved, you will refer the same to the Legislature at its next session, with such recommendations as you may deem proper concerning it.

Very respectfully, your obedient servant,

To the Honorable the Legislature of the State of

The American Forestry Congress would respectively invite the attention of your Honorable Body to the importance of giving early attention to measures tending to the maintenance of our Forest supplies.

The very important relations that exist between a due proportion of woodlands and our agricultural welfare, resulting from their influence upon climate; their protection from drying winds and their effect in the equalization of water supply, for navigation, hydraulic power, and the use of cities and towns, are scarcely less worthy of serious attention, and present questions that may properly claim the notice of a legislative body.

It is well known that in every country upon the continent in Europe, systems of forest management, originating from necessity, have grown up, and that codes and regulations for protection, working, and restoration have been devised, and matured as experience led, until they have become, in a great degree, adapted to the conditions and wants of their inhabitants, and to the requirements of their governments, in matters of timber-supply.

Although, from the differences that exist between the American States and the countries of Europe, as well with respect to the tenure of the land as the structure of the laws, which would prevent any one of the European codes of Forestry from being applied in America, still there are strong reasons for urging the adoption of carefully devised measures for promoting the maintenance and renewal of our forest supplies.

Since in the States and Territories of the United States, as well as in the Province of Canada, most of the settled portions of the country belong in fee simple to private owners, who are usually the actual occupants; and since the entire cost and care of management of the woodlands upon these estates must devolve upon these owners—it is evident that there can be no more effectual means devised for promoting this object, than by the diffusion of correct ideas among the owners of these lands, with reference to the forest interests of the country.

In the case of Fisheries, another element of national wealth, in which our citizens, in their individual capacity, have a great interest, although the Government itself can scarcely be said to have property, it has been found that great public benefits have been derived from the information obtained and disseminated through the agency of State Fishery Commissions.

The investigations made by Government in this matter, have been far beyond the means of individual enterprise, or even of associated private effort, and the operations of breeding, stocking distant waters with improved species, protection, maintenance, and restoration, which have been carried on, in a large degree, under the patronage and intelligent direction and advice of State Commissions appointed for this purpose, have greatly enhanced the value of our inland fisheries, and promise still greater benefits in the future. These Commissions of Fisheries exist in all the principal States of the American Union, and in Canada, and their benefits are realized more and more every year, as we learn their results.

In the case of our woodlands, we find in matters of public policy, and the promotion of the common interest, a strong resemblance with the case above cited. Information is to be collected; investigations are to be made upon questions before unknown; the introduction of new species is to be encouraged; improved and economical method are to be made known, and the public interest is to be awakened and maintained.

Although it would be obviously inexpedient and improper to confer authority upon a commission with respect to the control and management of private property, unless in exceptional cases where a public interest was concerned, there are many ways in which it could very greatly promote the general welfare, among which we may specify the following:

1. It might institute and conduct experimental stations, either upon lands specially acquired for the purpose, or with the concurrence of institutions of learning, where facilities exist, and the conditions are favorable. We would especially mention the colleges for instruction in agriculture and the mechanic arts, in the several States, formed separately or in connection with colleges already existing, under a grant from Congress, as proper places for aiding in these experiments. The coöperation of individuals might doubtless be secured in many cases. These experiments should embrace, as well questions of culture and management, for the discovery of best methods, as matters of scientific interest, including the study of the local climate in its relations to Forestry.

2. It might establish nurseries for the supply at cost, or otherwise, of approved species of young trees, especial care being taken to offer those only which afforded the best prospect of success, and the most useful product. These young trees (or in some cases tree-seeds), should be accompanied by plain and simple directions for their care and management, and the persons receiving them should be requested to report the results.

3. It might stimulate competition by the offer of prizes, for plantations remarkable for their extent or excellence, or for success in overcoming difficulties in planting.

4. It might reward the authors of approved essays, tending to make known improved methods, or to awaken an intelligent interest in Forestry, or to disseminate useful information upon any subject therein, calculated to promote the general welfare.

5. It might collect statistical and scientific facts, having reference to Forestry in its various economic and scientific relations, with the view of furnishing information in answer to private inquiry, or by way of public reports.

6. It might promote an interest in the subject by the hold-

ing of public meetings, addresses, and the discussion of subjects relating to Forestry and Rural Economy.

7. It might establish at its central office, a reference library, and collections for illustrating the various subjects pertaining to Forestry; and it might very materially aid, by advice and otherwise, in the formation of similar means of reference and information, at institutions of learning, and other agencies of public utility.

8. And, finally: it could carefully study the subject of Forestry, as it may grow in importance, with the view of recommending for legislative action such measures as may be deemed proper for meeting the wants of the country in this matter, as it comes to be better understood.

It is presumed that intelligent, capable, and public-spirited citizens might readily be found in every State, who would be willing, without pay, to give reasonable attention to this subject, by attending stated meetings of a Board, their actual expenses being paid. With a capable and intelligent secretary, devoting his whole time to his duties, upon reasonable pay, we might confidently expect that such a Board would in due time become a center of influence, and an important agency for good;—sustaining the expectations that gave it being, and abundantly repaying its cost in an advancement of the public welfare.

Upon suggestion by the President, that this memorial might be transmitted from the Department of Agriculture, with its suggestions tending to give it greater effect, upon motion of Dr. HOUGH, seconded by Prof. NORTHROP, it was so referred, and the report was accepted and adopted.

Mr. H. G. JOLY, from the committee appointed at Cincinnati in April, 1882, to report upon Forest Fires, and the Injuries to Forests by Cattle, made a partly verbal report, which was accepted and adopted. As this has not been received at the time of our writing, we are unable to present it.

Prof. ROBERT B. WARDER, from the Committee upon Forestry Education, appointed at the Cincinnati Session in April, 1882, made the following report, which was accepted and adopted:

REPORT OF THE COMMITTEE ON FORESTRY EDUCATION.

Many difficulties attend the discussion of this subject, many opinions prevail, and years will be necessary to work out in detail an educational system, in which the claims of

Forestry shall be duly recognized. Your committee respectfully submits the following propositions:

I. One or more special schools of Forestry may eventually be organized, modeled in most respects after those of Germany, but (like other American technical schools) demanding a less amount of general information, and linguistic training for admission. For the present, however, the business openings offered for trained Foresters, are not such as to encourage a suitable number of students in such a course, even with the modifications proposed. For this reason, among others, we believe that it is not best to urge the immediate establishment of such a school.

II. We may expect the interests of practical Forestry to be promoted incidentally by those engaged in agriculture, rather than by those who are exclusively Foresters; hence we recommend that courses of instruction in Forestry, as full and practical as circumstances admit, should be offered in the various schools for the promotion of agriculture.

III. Practical lectures before Farmers' Institutes, promise to be effective in communicating a large amount of practical information among those who will appreciate and apply it. It may be very desirable for State organizations to employ lecturers, and co-operate with the various local societies in this work.

IV. Local Experiment Stations, in which intelligent farmers unite in specified investigations, will have a real educational value,—both awakening a more general interest, and affording object lessons upon practical Forestry.

V. With increasing intelligence, and general information among the American school teachers, we believe they may do very much unofficially, to impart a love of trees, and habits of observation. An Arbor Day, designed for school children, as in Ohio, is a valuable educational means, though quite distinct from the Arbor Day designed for forest plantations, as in Nebraska and Minnesota.

VI. The Agricultural Press affords a wide opportunity for pioneer work in Forestry Education. Much has been accomplished by the Forestry Manuals in Minnesota and Kansas, and by the Iowa Forestry Annuals. It is a cause of regret, that so excellent a periodical as the AMERICAN JOURNAL OF FORESTRY should be given up for want of patronage. We believe that monthly or bi-monthly Forestry Leaflets, published as cheaply and scattered as widely as possible, may have a very useful influence. Such a publication may be offered in quantities to the local Horticultural and Agricultural Societies, at the bare cost of paper and printing. We believe that a guarantee fund of $300 would suffice to insure such publications for one year.

Signed on behalf of the Committee:

ROBERT B. WARDER,
ADOLPH LEUE.

It was ordered that a committee upon Schools of Forestry be appointed, and the following persons were named as this committee, viz: Prof. B. G. NORTHROP, Prof. R. B. WARDER, Mr. G. W. MINIER, Prof. D. W. BEADLE, Prof. J. L. BUDD, and Dr. F. B. HOUGH.

Mr. G. W. MINIER presented the following recommendation, which was adopted:

> "In view of the wide spread and happy results of the observance of Arbor Day in many States, this Congress recommends the appointment of such day in all our States, and in the Provinces of the Dominion of Canada."

Pending the adoption of the preceding, remarks were made by Messrs. BURSON, EGLESTON, and MINIER.

Judge WARREN HIGLEY presented a report upon the organization and operations of the Ohio State Forestry Association, a copy of which had not been received at the time of our writing.

Dr. FRANKLIN B. HOUGH presented a verbal report of the action which had been taken in the State of New York, in reference to Forestry, which may be briefly summarized as follows:

In 1872, a law was passed naming seven citizens of the State as a State Park Commission.[1] They were instructed to make inquiries with the view of reserving or appropriating the wild lands lying northward of the Mohawk, or so much thereof as might be deemed expedient for a State Park. It is believed that the leading motive in this was, to secure the benefits to be expected from woodlands, in the maintenance of the water supply for the State canals, and for hydraulic power, which had been materially injured by clearings.

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[1] This Commission consisted of Horatio Seymour, Patrick H. Agan, Geo. H. Raynor, Wm. B. Taylor, Richardson, William A. Wheeler, Franklin B. Hough, and Verplanck Colvin.

It was found, upon inquiry, that the State had only about 40,000 acres then in its possession in that region, the rest having been sold at nominal prices to timber operators and a railroad company. As soon as it was understood that the lands were wanted by the State, their owners showed a tendency toward combination, for the enhancement of values, and as the Commission did not propose to become accessories to this speculation, they simply recommended a law forbidding farther sales of these lands, and their retention when forfeited for the non-payment of taxes. In 1883—eleven years after this first law—the action then recommended was taken. The prediction had been verified, as now more than 600,000 acres belonged to the State, from neglect of taxes by the owners. This is only the beginning of a system of Forestry, since nothing was as yet provided for the management of the lands, except in one county only (St. Lawrence), where an agent has been appointed to look after the intersts of the State in the forests of that county. The law relating to tree planting along the highways has been very recently modified, and the germs of something that may grow into a kind of forest management, may be found in several local laws in various parts of the State, which provide that waste lands upon which taxes are not paid, shall become the property of the counties.

Very recently a call was issued for the holding of a convention for the formation of a State Forestry Association. The proceedings were merely preliminary, but three persons had been named to attend the present Congress and make a report. The speaker (Dr. H.) was the only one present.

Dr. HOUGH further remarked, that in the State of Vermont and New Hampshire, commissions had been appointed by law, and incipient measures were in progress for ascertaining the duty of these States, with reference to the Forestry question. As no representatives appeared from these States, he was not authorized to say what had been done, or what was intended.

The Hon. MARK H. DUNNELL, for many years member of Congress, and mover of the principal acts that have been passed, relating to timber culture and investigations upon Forestry, being introduced, addressed the Congress at some length, upon these subjects.

The following named persons having been recommended by two members, were then elected, viz:

Prof. EDWARD DANIELS, of Saint Paul, Minn.

Prof. J. L. **Budd**, of Ames, Iowa.
H. H. **Young**, of Saint Paul, Minn.
D. A. **Robertson**, of Saint Paul, Minn.

Mr. D. A. **Robertson** presented the subject of publication of the proceedings, and suggested the appointment of a Committee to Memoralize Congress, with the view of procuring an appropriation for that purpose. Discussion arose thereupon, pending which the hour for recess having arrived, the Congress adjourned until 2 o'clock, P. M.

AFTERNOON SESSION, *August 9th.*

The Forestry Congress having been called to order by the President, at the hour appointed, Dr. **Franklin** B. **Hough**, from the Commission appointed at the Montreal Session, in August, 1882, to report upon the subject of "*Legislation in Relation to Forest Fires*," made the following

REPORT.

The Executive Committee of this Congress was instructed, at our last meeting, to refer certain subjects for report on the present occasion, and, among these, "Legislation in Relation to Forest Fires," has been assigned to me for consideration.

We find, already, legislation of some kind, in nearly every State and Territory of the Union—in Canada and other British Colonies—and in every country in Europe. With the view of ascertaining what had been done in this line, I carefully collected our existing legislation upon this subject, and it will be found in my third report, in which this subject is considered with much detail.

The fact that prohibitions are imposed in any law, upon any subject, assumes that something is or may be wrong—and when we find penalties, the presumption is that they can or should prevent this wrong or injury from being done. We find neither prohibitions nor penalties against what is unavoidable—they are enacted only in cases where it is presumed that they will prevent some injury from being done, which might happen without them. Without spending a moment upon the origin of forest fires from natural causes, and which are fortunately of rare occurrence, we may attribute the greater part to human agency, and as originating either from intentional motives, or through carelessness or accident.

We find that fires are intentionally kindled, with the expectation that they will spread to more or less extent, in the following cases:

1. In clearing land of its timber, as in the beginning of all settlements in wooded countries, and occasionally, from time to time, in the ordinary operation of cutting off wood lots, and in lumbering.
2. For agricultural improvement, in the burning off of stubble and rubbish, to clear the ground for cultivation.
3. In certain operations in the woodlands, where it is desirable to get rid of the underbrush, by the aid of ground fires, so as to render it easy to get around, as in woods worked for turpentine, etc.
4. For improvement of pasturage in woodlands and waste places, by burning off the dead and dry herbage, and to favor the growth of the succulent grasses.
5. For exposing the ground, as in search for nuts or fruits, —in prospecting for minerals and ores, and the like.
6. For clearing the ground of materials that might favor the spreading of ground fires, to the peril of buildings, fences, or inclosed fields.
7. From a wanton desire to see a "big fire," but without intention to do injury, or with the expectation that no great harm will ensue; or,
8. With malicious design, and for the purpose of destroying property, or of concealing a trespass; or, in the case of hostilities, as a war measure, to injure an enemy.

The spreading and destructive fires, originating from carelessness or accident, may be kindled by any of the above mentioned causes, except the last, the escape being sometimes unavoidable, or beyond the means at hand for control—and sometimes from want of common prudence and forethought, in leaving a fire, or some burning object, in places where a fire may catch and spread, as in throwing down a burning match or cigar, or in the use of gun-wads in hunting, that ignite and retain the fire. They may spring from a neglected camp-fire, kindled for cooking or warming—or from a coal-pit where charcoal is being made, or from fires or sparks dropped in any manner—as notably in the case of sparks or coals from a passing engine on a railroad.

The extent of the disaster, however, it may be started, will depend upon a variety of causes, chiefly the condition of the soil as to drouth, and the force of the winds. A great deal will also depend upon the nature of the soil itself, and upon the kind of timber and other vegetation that grows upon it.

Light sandy soils, when overgrown with evergreens of the coniferous species, and with the undergrowth that usually accompanies them, are particularly liable to spreading fires; while a heavy clay soil, or fertile loam, underlaid by limestones and shales, may favor the growth of deciduous trees, and a rank and humid undergrowth, in which a forest fire could scarcely be made to spread, and in which a disaster of this kind is scarcely ever known.

We also find that the season of the year has much to do with forest fires. They are seldom or never known in winter; but in the early spring months, after the ground has become dry, and before vegetation has made much progress, we find the conditions dangerous. It is the same in a dry summer and autumn, and especially in times of excessive drouth, and in high winds. At such times, when this aridity was intensified, the memorable fires of the Miramachi in 1825, and the forest fires in Michigan and Wisconsin in 1871 and 1881, occurred, with destructive energy, and wide spread ruin, consuming millions of dollars worth of property, and destroying great numbers of human lives.

We have started with the theory that prohibitions and penalties imply an avoidable cause. Let us consider, separately, how this will apply in the several classes of causes that have been above enumerated:

1. In the clearing of land, a little judgment will enable the careful man to avoid a time for the burning of his brush when there is great liability to the spread of fires beyond control. But as some men have not this "little judgment" and this "care," it would be an effectual check upon their carelessness, if we had a law requiring them, before applying fire, to get a permission from some proper town officer, such as the supervisor, the selectmen, the trustees, or such other officers as the State laws recognize as the guardians of the public interests of the town, and who would presumably be men of prudence and good judgment. They should also be obliged to notify their neighbors of their intention, so that proper watchfulness might be awakened, where the possibility of danger to adjacent woodlands might be apprehended. They might be still further restricted absolutely from setting fires in certain months known to be dangerous in common or exceptionally dry years.

In this matter of burning brush, it should be more generally known, that it is not a very difficult thing to dispose of it gradually, as the clearing progresses, by getting a fire well started, and then throwing the brush upon it. In the case of resinous woods, this may be done at once, and in the deciduous kinds, as soon as they are somewhat dry, but before they have become like tinder.

2. The danger from field fires, in the burning off of stubble and dead grass in fall or spring, as on the prairies of the West, may be greatly lessened by plowing two belts of land, and carefully burning off the rubbish on the strip of land between them. Where this precaution is taken, it is not difficult to keep these fires away from stacks of grain, buildings, and plantations, and it might, in these States, be well to require this to be done by law. Here, as in the case last mentioned, there is great need of prudence and caution, and in cases of the least uncertainty, the advice and aid of others should be obtained. In this, also, there should be a prohibited season, wherever there is need.

3. In cases where it is thought necessary to clear the ground of underbrush, the need of caution and counsel is quite evident, and the subject should be placed under the restrictions of law.

4. The custom of burning off woodlands, especially in mountain regions, is one of the worst that we have to contend with in certain portions of the country. It is often practiced by those who have a few cattle but no land, and who depend upon finding subsistence for their stock upon the uninclosed lands of others, or upon the public domain. There is nothing more likely to arrest this practice, than an efficient stock law, requiring every owner of stock of whatever kind, to keep them upon his own premises, under the penalties that may result from their trespass and damage upon the lands of another.

Where an owner thus sets running fires on his own land, to improve the pasturage for his own stock, there should be a legal prohibition as to dangerous seasons of the year, and ample responsibility for the payment of damages, that may result from his fires, upon the property of others. The penalty of a fine is generally effectual, in the case of a land-owner, for the possession of an estate implies a certain degree of care, industry, and forethought in the owner; and such a person would realize the responsibilities of the situation, if fully known beforehand. But there is a class of men, and unfortunately it is a large one, who, having neither care, industry, nor forethought, and, therefore, no land, would care nothing for a fine, because they have nothing that the law could reach, if its collection was attempted. For this reason, any law imposing a fine as a punishment, with respect to the setting of fires that escape from their lands, to the injury of others, should end with the clause—"or imprisonment for a period of —— days, unless the fine is sooner paid."

5. The clearing off of leaves by fire, for the purpose of exposing the ground, is most likely to be practiced by boys, in search of nuts, and who do not realize the danger that may result, or by those prospecting for ores and the like, who care as little for the consequences as the common tramp. It may not be a very common or a very important cause of these fires, but it should be forbidden on lands not owned by the person who sets the fire, and should, in this case, be coupled with penalties where it injures another.

6. In light sandy regions, and in cases where the Pitch Pine and other resinous woods form the principal forest growth, there are seldom many years together in which we do not hear of distressing accounts of woodland fires. They have been particularly disastrous upon Cape Cod, in the interior and eastern portions of Long Island, and in southern New Jersey. In these fires, we often hear of the burning of farm houses, fences, bridges, mills and other property, and they generally leave the soil greatly impoverished. In such regions, there is a continued liability to the recurrence of these fires, whenever the conditions are a little more favorable to their spread, and nothing but continual care and watchfulness can prevent them.

In such regions, it is undoubtedly a good practice to keep the borders of the woodlands along the railroads, and around buildings, clear of rubbish and litter, by carefully burning off a strip of land in the winter, and when the fire can scarcely be made to spread, and is easily controlled. Where this is done every year, the amount of combustible material is slight, and the risk is reduced to next to nothing.

It is, therefore, advised that legal provision should be made, requiring railroad companies to keep the rubbish and dead herbage, that might be liable to spread the fires, burned off every year, and forbidding them to allow piles of old ties and other combustible materials from accumulating or being left along their roadway.

7 and 8. From wanton and willful burning, we have no hope of escape, except in the execution of proper laws against malicious mischief and deliberate crime.

Before considering the measures that might be recommended in our country for preventing by legal enactments the spread of forest fires, let us briefly notice what has been attempted, and what has been accomplished elsewhere. There is a district of country in southern France, some forty or fifty miles in extent, between Nice and Marseilles, and fronting upon the

Mediterranean, that has, in former years, suffered often and severely from forest fires. The conditions were peculiarly liable to the occurrence of these fires, as well in soil and climate, as in the vegetation that covered the surface. The soil is rich, resulting from the decomposition of schist, porphyry, and granite. It is exposed to an ardent sun, and watered by abundant rains at the season most proper for giving exceptional vigor to forest vegetation, and, as the result, an abundant accumulation of litter. But it is also liable in certain seasons, to protracted drouths; and in such a time, the least spark of fire, in a strong wind, would start a conflagration which nothing could stop, until the tinder upon the ground was burnt off. The forest trees in this region were chiefly Chestnut, Cork-oak and the Maritime Pines, and the undergrowth various species of broom, heather, and herbaceous plants that become dry and inflammable in a drouth.

The repeated and ever-recurring damages resulting from these fires, led the Government in the autumn of 1868, to send the Director-General of Forests (M. Faré) to make a careful study of the causes of these disasters, and, if possible, to devise the remedies for their prevention. Having prepared a list of some two hundred names, selecting the principal proprietors and industriels of the district, he first addressed a circular of inquiries, and then convened as many of them as could attend, for the discussion of the subject, and the collection of data upon which conclusions could be formed. The results in the way of oral evidence and written opinions were published in detail. There were also separate publications upon the subject, the more important one being by M. Charles de Ribbe, who deals with great intelligence upon questions relating to the causes of these fires, their history, and the measures that should be taken for preventing them.

It was noticed, as to ownership, and incidentally as to the effect which this had upon surveillance and prevention, that the richest portion, and that chiefly devoted to the Cork-oak, belonged to many small proprietors, while the poorer parts, covered with the Maritime Pine, and largely devoted to resinage, was owned by a few persons, some of them having tracts of several thousand hectares each. It was natural to expect that the former were better cared for, and that the greatest precautions had come to be adopted for preventing the origin of fires. But on the other hand, this parcelling out into small properties, is not favorable for concerted effort; as, in case of danger, every man would be most anxious to save his own, while the wealthy owners of large estates could more easily associate in the adoption of measures for their common welfare, and that a more systematic effort might bring a better result.

But, in the present instance, although there was a great diversity in ownership, and the woodlands were for the most part contiguous, or at least with no large clearings intervening,—however diverse the local interest might be, they were menaced with a common danger. The inquiries undertaken in this instance, brought out, as might have been expected, a great variety of opinions as to causes and prevention, as each one reasoned from his own standpoint, and from the little circle of observation around him. They very generally agreed in this, that means should be devised for preventing their neighbors' fires from running over their own possessions, but were more or less widely variant as to the remedies that should apply to the whole.

As to the causes, M. Faré arranges them under two classes:—the one purely intrinsic and belonging to all woodlands, and the other exceptional, and produced by the special circumstances that have been already noticed. It was chiefly to the latter, that these sweeping disasters might be attributed, since two-thirds of the Department, having a different soil and forest growth, but otherwise the same rains and drouths, and the same exposure to the sun, suffered no inconvenience from this cause.

The fires were generally started by careless hunters, by smokers, by charcoal burners, and very often from a practice of setting fires for the purpose of clearing off the mosses, herbage, brambles, and rubbish, in which it was generally intended to keep the fire smouldering under a covering of turf, but which in a dry and windy time might easily escape control.

This inquiry resulted in the enactment of a law, limited to twenty years from April 13th, 1870, the date of its passage, the leading features of which were as follows:

The Prefect, with the advice of the General Council, was to fix the time in each year, within which no fires were to be kindled within the woodlands, or within 200 meters of their borders, for any pretext either of Forestry or agriculture. Notices of this order were to be posted fifteen days previous to the forbidden season.

At times not included within this season, fires might be built, provided the space be inclosed by protecting trenches.

Between adjacent properties, a cleared avenue should be maintained, at the joint cost of the owners. The power of arresting offenders was extended, and vigilance, especially in the dangerous season, was increased. The fines were to be not less than 20 nor more than 500 francs,—but these were to be in addition to the damages that might ensue.

At a somewhat later period, frequent and disastrous fires occurring in the region of the Landes, in South Western France, in the young Pine forests, led to another investigation by direction of government, by M. Faré, and an extended report was made, but not leading to any special law. In visiting this region in 1881, I learned, upon inquiry, that these fires had ceased to be troublesome, and was told that they had probably been set for a malicious end, a certain family owning extensive tracts of Pine, being the heaviest losers. Through some financial failure, great numbers, acting under the advice of members of this family had lost their little all, and to revenge this grievance, these fires had been set.

But returning to the question before us, as it is presented in the United States and Canada,—and reasoning upon the assumption that destructive fires are very generably avoidable with proper caution, I will attempt to draft a bill, that with some modifications might be made applicable in any of the States, Territories, or Provinces, and which, if sustained by public sentiment, and properly enforced, could not fail to render these disasters less frequent, if they did not hinder their occurrence entirely. I will give it the title of—

"AN ACT TO PREVENT THE OCCURRENCE OF FIELD AND FOREST FIRES."

Be it enacted, etc.

SECTION 1. It shall be the duty of the Board of Supervisors [County Commissioners, or other authority in charge of the public business of counties], in districts liable to suffer injury from forest fires, to establish rules restricting the setting of fires in fields or woodlands, and forbidding them entirely, in what experience has shown to be a dangerous season of the year. These rules may be revised annually.

§ 2. In every township, the inhabitants, when assembled at their annual town meetings, may elect as many Fire Wardens as they may determine by a public vote. If there be more than one, the district of each one shall be described by roads or natural boundaries, a record of which shall be made in the office of the town clerk.

§ 3. It shall be the duty of the Fire Warden, in case of a spreading and dangerous fire, to take the chief direction of measures for arresting its progress, and he may order any citizen to assist in this labor, under the penalties hereinafter mentioned.

§ 4. In the absence of the Fire Warden, the Supervisor [or other officers in charge of town business] may designate in writing some person to perform the duties of such Fire Warden, and the person so appointed shall have the same authority as if duly elected.

§ 5. In cases of great danger, a Fire Warden, with the approbation of a Justice of the Peace, may order back fires to be set, or property to be destroyed, to stop the progress of the fires. Any structures thus destroyed shall be paid for as a county charge.

§ 6. The expenses necessarily incurred in stopping the progress of a forest fire, shall be audited and paid by the Board of Supervisors [or other county board, as the case may be], as a county charge. It shall be lawful for the inhabitants at town meetings to fix the rate that may be paid for services in arresting a spreading fire, and to limit the total sum that may be paid: but in no case shall any allowance be made for services to any person through whose act or negligence a fire originated, nor shall payment be made for losses incurred, otherwise than as mentioned in the last preceding section of this act.

§ 7. No person shall, at any time within the season prohibited under the first section of this act, set fires in any field or woodland, for the purpose of burning brush, or clearing the land for agricultural purposes, or for improving the pasturage.

§ 8. No person shall, at a season not included in this prohibited period, apply fires in any field or woodland, for the purpose of clearing or improvement, without first obtaining permission from the Fire Warden of his district. He shall also notify any neighbors who may have fields or woodlands adjacent, and liable to injury, at least one day previous to the setting of such fires.

§ 9. No person shall kindle any fire in any woodland, or within two hundred yards of its borders, unless the combustible materials be first cleared away within six feet of the place where it is kindled:—Nor shall any such fire be left, until it is fully extinguished, or safely covered.

§ 10. In the making of charcoal, there shall be provided at least one barrel full of water to each pit, with pails in readiness for use in the case of a fire escaping and liable to spread. All combustible materials shall be cleared away to a distance of fifty feet from the pits or kilns in which charcoal is made.

§ 11. It shall be the duty of railroad companies, to cause the dead herbage, and other inflammable materials within their right of way to be carefully burned off, once a year, at a time when this can be safely done, and with a sufficient force in readiness to prevent injuries therefrom.

§ 12. In districts where it is a common custom to provide against the spreading of field fires by plowing strips of land,

and burning off between them, such strips may be plowed and burned once in a year, along the boundary of adjacent properties, and along lines of railroad, at the joint expense of the owners. In case that either of said owners, upon request from the other, shall neglect to do his share of the labor, it may be done by the other, and one-half of the cost thereof may be collected, as in an action for debt.

§ 13. And whereas, experience has shown that great benefits result from the maintenance of cleared avenues in a forest, for the control of forest fires, it is hereby enacted, that wherever a line of property between two owners runs through a woodland, and whenever the Fire Warden shall deem the measure necessary, he may direct the owners to clear and maintain such an open space, of not less than fifty feet in width, half of it being on each side of the line, and the expenses to be equally borne by the owners thereof.

§ 14. It is forbidden to throw down a burning match, or any lighted cigar or other burning object, in any field or woodland, without immediately extinguishing the same. It is also forbidden to use tow, or other material liable to hold fire, as a gun-wad. It is further forbidden to discharge any fire-arms within a forest, during the period that is designated as dangerous, by the Board of Supervisors, [or other county authority.]

§ 15. The following penalties are imposed for each violation of the provisions of this act:

For disobeying the orders of a Fire Warden, from $5 to $50.

For setting running fires in the forbidden season, from $50 to $500.

For setting fires in the season not forbidden, but without permission from the Fire Warden, or notice to neighbors, $5 to $50.

For kindling fires in violation of § 8, or for neglecting the requirement in § 9, from $5 to $50.

For neglecting the requirement in § 10—from $5 to $10 per mile.

And in case of non-payment of fines, the person upon conviction may be imprisoned in the county jail one day for every $2, of the fine imposed.

§ 16. It is further provided that in addition to the foregoing penalties, every railroad company, and every person, through whose act or negligence a field or forest fire originates, shall be liable to pay the damages which such fire may occasion.

§ 17. And be it further enacted, that the Board of Supervisors [or other county authorities,] may cause printed notices, stating the times when running fires are prohibited, and the various penalties mentioned in this act, to be posted in each school-house, and at such places as election notices are posted, throughout the county, or in such towns as they may deem proper, and the expenses of this may be made a county charge.

§ 18. All penalties incurred under this act, shall be prosecuted by the Fire Warden of the District before a Justice of the Peace, and in the name of the people. The moneys recovered, are to be paid into the County treasury, to be applied first to the payment of expenses incurred under this act, in the extinguishment of forest fires, and if any remain over,—for the support of roads and bridges in the towns where the fines were incurred.

§ 19. This act shall take effect immediately.

I have thus presented the outlines of a plan of legislation, which I think might be modified to meet the wants of every part of the country. It embraces the following principles:

1. A local option in the county authorities, who would be best able to judge of local wants and circumstances.
2. A recognized anthority in directing operations, as in the case of city fires, where the Chief of a Fire Department, or his representatives may compel assistance in case of fires.
3. A county charge for necessary expenses. This is justified and allowed in the case of property destroyed by a mob, upon the principle that the county owes protection to its citizens and that having provided an agency in its civil officers, for the prevention of crimes, and the protection of property,—which may be expanded to meet an emergency at any time,—it is bound to exercise this power for prevention and protection,—or pay the losses that may happen from failing to do so:
4. Personal responsibility in the use of fire, and penalties for carelessness, whether damages ensue or not.
5. Responsibility for damages resulting from fires, as a matter of common justice, and upon the general principle, that if any person injures the property of another, he shall pay him for it.
6. A pecuniary fine for carelessness and wrong doing, which may, within certain limits be proportioned to the offense,—or a personal punishment in default of payment.

In studying this subject, we can not fail to notice, how much of these calamities is avoidable, with due caution:—how much might be saved, by a little timely thought, and habitual care,—and how might be gained, by instilling into the minds of the young,—in our families and our schools those habits of caution and prudence, and regard for the rights of others, that would in future prevent so many of these losses that we now deplore.

MR. BERNHARD E. FERNOW, having prepared a Report upon the Management of Burned Forests, and effect upon the Soil and Forest Growth, and not being in attendance, his Report was read by the Recording Secretary, as follows:

MANAGEMENT OF BURNED FORESTS, AND THE EFFECT OF FOREST FIRES ON THE SOIL AND FOREST GROWTH.

It is evident, that the management of a burnt forest, *i. e.*, the efforts to repair the damage done by the fire to the standing growth, as well as to the soil and to the prospective value of the forest, must depend not only on the requirements of the kind of trees of which the forest is composed, and the system of management, for which the forest was intended, but also on the intensity of the fire and the degree of injury, which has been inflicted upon the growth. We have to study the influence of the fire on the soil and on the standing timber, before we can decide upon the treatment.

When we contemplate the method of the prairie settler, or the Kossack of the Russian steppes, burning over his grazing lands with a view of encouraging the sprouting of new grass, of enriching the soil for a richer verdure, we might be tempted to consider the burning over of a forest tract, if only kept within bounds, so as not to injure the timber, as beneficial, after all, to the growth of trees. But here we are drawing a mistaken analogy; for, whilst the production of grass and herbs, in fact, of all agricultural vegetation, depends mainly on the mineral richness of the soil, in Forestry this factor of the growth takes a very different part. The tree lives mainly from the air, its bulk is made up by the decomposition of the carbonic acid of the atmosphere and of water. The influence of the soil on the forest growth is almost entirely based on its physical properties, and of these especially on its capacity of absorbing and retaining moisture, the main agent of successful tree growth.

The yearly fall of leaves and dead branches and twigs, not only returns to the soil the greatest part of any mineral substances absorbed by the trees, and thus sufficiently renews, if that were necessary, the richness in inorganic elements, but, by the decay of this vegetable mold, a soil-cover is formed, which eminently possesses the desired quality of receiving the atmospheric precipitations and returning the same to the trees as needed; besides this vegetable mold or "*humus*," being a bad conductor of heat, it counteracts the drying effect of the scorching sun, wherever the crown-cover of the thinly foliaged species or of the sparcely standing trees does not afford sufficient protection for the soil.

Now this cover is first attacked by the devouring flames, and is converted into ashes to a greater or less depth, according to the season when the fire occurs and the consequent relative humidity of the soil; and by its destruction, the inherent favorable physical qualities are removed from the soil. Especially where the natural conditions of the underlying soil are of a poor description, such as the dry sands of the diluvial plains, the destruction of the "*humus*" accumulated through many years often seriously affects the capacity of the soil for successful tree culture; and when, to crown the disaster, the protecting cover of the trees themselves has fallen a victim to the ravaging element, giving access to wind and the parching sun, the ingenuity of a forester will indeed be taxed to the utmost to restore the necessary conditions of forest growth; nay, it may become almost impossible! Although the fire may not have attacked the standing timber, yet the injurious effect will be visible years hence, when the trees are cut; one or several smaller annual rings following the years after the catastrophe, will note the consequent decline of growth, or. to borrow a financial expression, a reduction of the yearly dividend.

The vitality of the trees may be impaired by the action of the scorching flames on the cambium layer, and even if utilized at once, the injured butt logs, the most valuable ones, will often count a considerable deficit in the estimate of timber. In hard-wood forests, where the reproduction is expected from the stocks, as in the coppice, the reproductive power is injured in proportion to the degree of heat developed by the fire. In the pineries, where reproduction can only be expected from the seed, the young seedling falls the first victim of the merciless foe. Where the fire kills the original growth, or causes its speedy death, the conditions of forest growth are at once changed, and those alternations of species occur, which are a natural consequence of the change of these conditions. The shade-loving and shade-bearing species find as favorable inducements, and the light-seeded ones, which produce seed plentifully and give it to the distributing winds, take possession of the place, excluding by their rank and vigorous growth the existence of their more pretentious and slow-growing brethren. Unfortunately, the latter ones are the more valuable kinds. Yet we must be thankful that the tribes of Birches, Poplars, Cherries, and Willows, will be satisfied with the unsatisfactory conditions presented to them by the burned forest, because their decaying foliage and the cover they afford to the soil recuperates in time the powers of the same to bear a better crop, and recalls to useful production the ruined waste. I may be allowed here to quote Prof. C. S. Sargent's description of this process:

"If a forest is destroyed by fire, which kills the trees and undergrowth of shrubs and herbs, the same species, except in the case of some of our least valuable trees, rarely spring up again. Let us take the case of a White Pine forest. If a forest of White Pine is destroyed by fire, this tree does not spring up again. The land which, if only a part of the trees had been cut, would have continued to produce Pines indefinitely, is not covered again with any growth of trees for a considerable period. The fireweed first makes its appearance. The light seed of this plant is often blown for a long distance, and, falling upon the bare ground, germinates quickly and finally covers the burnt surface with vegetation. Birds drop the seeds of raspberries and blackberries, which find sufficient nourishment and light for germination. These, as they grow, cover the ground and afford protection to the stones of the little Mountain Cherry, dropped by birds also, or the light seeds of the Gray Birch, or some of the Willows or Poplars, which are constantly blowing about, and which will germinate anywhere upon unshaded ground, however barren.

These are generally the first trees which succeed a White Pine forest, destroyed by fire; but years often elapse before the ground is covered even with such trees.

Nature works slowly, and the wounds made by fire on the earth's covering of trees, are only healed, under the most favorable conditions, through the gradual growth and decay of many generations of plants. The Cherries, and the Birch and Poplars are short-lived; and, unless burned up (when the same process of recovering the soil commences again), are succeeded by more valuable broad leaved trees. Squirrels and other animals deposit acorns and nuts in the ground, and the wind brings the seeds of Maples, Ashes, and the valuable Birches. Such seeds find protection among the Poplars and Willows, which had sprung up on the burned land; and, as these die, the more valuable trees get a chance to grow, and gradually occupy the ground. This new forest of hard-wood trees, if protected from fire, will long occupy the ground, and the original Pine forest will not appear again, until the land, long enriched by an annual deposit of leaves, has been again stripped of its tree covering, and mellowed by years of cultivation. The different processes, however, by which White Pine land, on which the forest has been destroyed by fire, has been again brought into the condition to produce, spontaneously, another crop of Pine, have occupied a long period of time—so long, indeed, that it must extend through generations of human life. The forest fire, then, which destroyed the Pine trees growing upon the land, destroyed also the capacity of the land to reproduce a similar crop of trees, during a period which may be set down at from fifty to one hundred years."

What, now, can human ingenuity do to meet these disastrous effects, and to recall to profitable use a forest so destroyed—so withdrawn from the production of valuable timber? What is the best management of a burned forest?

Before answering these questions, let me recall to you the old adage, that "an ounce of prevention is better than a pound of cure"—never more so than in this case, where, what it took decades and centuries to produce, may be destroyed in a day, through criminal carelessness and inexcusable neglect.

What may, and ought to be, done by legislation, will be discussed by another member of this Congress; let me only call attention to some advisable means by which the forester himself may secure his property, or, at least, reduce the danger and risk of fire, and confine it to smaller limits.

Whatever may be done in regard to a vigilant fire watch, to careful handling of fires, outside and inside the woodlands, the following methods are successfully adopted for the purpose of restricting the spread of eventual fires:

In the plain, and especially in pineries, the plantations are divided into blocks of any desired area, by openings or avenues, of from two to six rods in width. In a well-regulated forest management, these blocks serve more than one purpose. Not only do they make possible the confinement of running fire within the limits of the blocks—the opening, or "fire guards," presenting convenient lines of defense for counter-fires, etc.; but they form, also, the basis of an orderly division of larger forest areas, for purposes of management; they enable easy location, by numbering the blocks; they facilitate access to any one point of the forest, and allow a closer estimation of the standing timber. The avenues, instead of increasing, diminish the danger of storm-falls, if opened up at a proper time, since the outside rows of trees accustom themselves to the sway of the winds, and, by taking firmer hold with their roots, adapt themselves to their more exposed situation. The increased accretion of the outside rows of trees, due to the admission of the sunlight, will mostly compensate for the reduced forest area. The size of the blocks may depend, not only upon the size of the area so to be divided; but, also, upon the thoroughness of the management, and especially upon the degree of danger from fires. For the latter reason, resinous woods should be divided into smallest blocks, and the fire-guards should be broadest. In Prussia the blocks are generally made one hundred to two hundred acres, and the form is mostly an oblong, the most convenient form for removing the timber from the blocks. In the mountains, the divisions are best adapted to the confiuration of the ground. Here, as well as in the plain, it is advisable to arrange these openings, so as to serve eventually as roads. It is now the maxim in Europe, that the first requirement of a well-conducted forestry, is a properly constructed system of roads. If, in this country, the conditions do not yet call for such orderly management, the time will not be far distant, when, at least in Eastern States, and near wood-using centers, similar attention to detail will be requisite, and the economy of such order will be apparent.

Where the risk of fire is occasioned by the proximity of a railroad (and as long as efficient spark arresters are not invented, or their use not enforced), recourse may be had to the formation of safety-belts along the endangered line. Such a belt consists of a belt of, say, sixty or seventy feet along both sides of the railroad, cleared of all timber, and kept free from inflammable rubbish, which spaces, where opportunity offers, may be put to agricultural use. In Prussia, very often, the track-walkers use the ground for their gardens and potato patches.

Or, if the ground shall not be spared from timber-culture, the growth of a thin foliaged desiduous species, like the Birch, may be allowed on such a belt, taking care, however, to clear away any casual undergrowth and litter, which, by its inflammability, would increase the danger.

The plowing up of a few furrows, or a ditch, between the belt and timber, is a cheap additional precaution.

The practice or burning the rubbish after clearing, to avoid dangers from fire, can be recommended only where no other precaution will do, or where, as sometimes in Pine woods, the additional danger of destructive insects may be increased by offering a favorable breeding place in the dry litter. Otherwise, as has been stated, any firing must be considered injurious to the capacity of the soil, and especially on sandy soils, with only a thin, humus cover, it may prove utterly ruinous.

In regard to the management of a burned forest, it must not be forgotten that the consideration of this question involves a financial, as well as a purely forestal problem. In this country, especially, where the desire of realizing all the value for the present, without regard to the future, is prevalent, the distance and the fastidiousness of the market, the lack of demand for inferior grades and for fire-wood, may often preclude all efforts to exercise any systematic forest management.

Considerations for the financier would be the following:

The possibility of utilizing the remaining timber at any profit, or, at least, at cost of working it.

The value of the loss in accretion by the impaired vitality of the timber.

The loss of ground rent for the time of reforestation and growth to the size of the destroyed forest.

A change of system of management—for instance, from coppice to timber forest, or from forest culture to agriculture.

Choice of a more valuable, or a quicker growing species, for reforestation, instead of the former slow grower or less valuable timber, etc.

The financial question (which is of a local character), set aside, the treatment depends on the species, and on the system of management adopted. In the coppice, when the stems have been, not only blackened, but partly burned, the only plan which can be recommended, is to clear at once at the proper season. Otherwise, decay will set in, and the vitality of the stocks will be greatly impaired. The same rule may be best applied to young plantations of deciduous trees; the new sprouts will, if property thinned, in most cases, and with most species, soon replace the cover. It is, however, in the further management of these, to be considered, that the rate of growth of sprouts is different from that of seedlings; and that, though the sprouts of most species will show a thriftier growth in the first years, their height accretion relaxes earlier, and they attain their greatest mass accretion and their maturity sooner than seedlings, and thus call for a shortening of the rotation.

As regards the retaining of such groups of trees, or of individual trees, as were not injured by the fire, this is a temptation to which we must yield only with caution, since their shade may be injurious to the young shoots around, impeding their growth.

In larger growths, intended for timber forests, if the injury does not extend to a total destruction or nearly so of the trees, it must be kept in mind that a fire induces earlier maturity, and that, where a healing from the effects of the fire can not be expected, the utilization of the timber with a view of natural re-seeding, or else clearing followed by immediate reforestation, should be adopted.

Where the destruction is a total one, no wiser plan than immediate re-planting can be recommended; this is especially the only measure with resinous trees, which are almost certain to lose their ground entirely, if, after a fire, left to themselves in the struggle for existence.

It is not to be forgotten that the dead trees remaining offer the very best opportunity for an increased development of injurious insects.

In forests of deciduous trees, where the heat of fires generally is not as intense as in Pine woods, it may be a cheap-plan to await a new growth from the stocks, and by carefully nursing the more valuable species, cutting back the less valuable ones, eventually filling up bare spots by planting or seeding shade enduring species, to recover in time, the lost ground for the valuable species.

In this, as in every other problem of Forestry, it is impossible to prescribe definite rules that will cover all requirements of particular cases. A thorough elementary knowledge of the conditions of forest growth alone, will enable the forester to decide what methods to adopt for the restoration of the lost growth, and to repair the damage inflicted by fires upon the soil and the forest."

Mr. JOHN S. HICKS, appointed at the Montreal meeting, to report upon the White Pine, made a communication partly verbal, and accompanied by specimens of the wood.

Mr. ROBERT W. FURNAS read a paper upon the formation of rings of wood growth, illustrated by specimens tending to show that the number of rings in a section is not certain evidence of the age of the tree. He also exhibited an extensive series of woods, framed, and other specimens, chiefly from the Pacific coast. A general discussion ensued upon the subject of wood growth, in which Prof. BUDD exhibited specimens of the *Populus alba*, admitting of a fine finish and proper for valuable uses. Messrs. FOSTER, HOUGH, FURNAS, BUDD, MINIER, JOLY, HICKS and BESSEY made remarks, and the Congress passed a vote of thanks to Mr. FURNAS for the interesting collection which he had exhibited.

Mr. OLIVER GIBBS, Jr., Secretary of the Minnesota State Horticultural Society, applied for permission to publish such of the papers presented at the session as might be deemed of interest to his society. Permission was given, and the Recording Secretary was directed to furnish him with a list of of the papers for selection.

Dr. **Franklin B. Hough** then read a paper entitled, "*Association of Interests in Forest Culture,*" and another paper entitled, "*On the Maintenance and Renewal of Forest Tree Plantations upon the Prairies.*"

Mr. **Suel Foster** made some remarks upon the latter, stating as the result of his experience that in clearing off of artificial plantations upon prairie land, it is preferable to cut clean, and start anew.

Mr. **H. G. Joly** next read a paper entitled, "*The Study of Forestry as an Important Contribution to Practical Education.*"

Prof. **Edward Daniels** read a paper entitled, "*How Shall the Schools be made Interested in Forestry?*"

A communication was received from Gen. **Hermann Haupt**, Manager for the Northern Pacific Railroad Company, inviting the Association to an Excursion upon their road. The thanks of the Congress were voted to Gen. **Haupt** for this courtesy, and Mr. **J. Fletcher Williams** was requested to ascertain the details of arrangement.

Prof. **Wm. R. Lazenby**, from the Committee appointed the day previous, to report upon Tree Planting, made the following report:

REPORT OF COMMITTEE UPON TREE PLANTING.

"Forest Trees exist mainly for use, and no knowledge pertaining to the subject of Forestry is more essential than to know how to raise them. Trees may be planted for at least three distinct and special purposes:

(1.) For Timber.
(2.) For Shelter (an object too often overlooked), or,
(3.) For Ornament.

Your Committee would emphasize the fact, that the variety of trees grown for any of these special purposes, the manner of treating the seed and raising seedlings, the method of transplanting and after cultivation, will depend very greatly upon the conditions of soil and climate. Hence the success or failure of tree-planting in one section, will be no criterion for success or failure in another. So variable are the attendant circumstances, that nothing except a very general report upon the raising and management of trees will be given.

Propagation by Seed. No specific time can be given for securing all kinds of tree seeds. As a rule, they should be gathered soon after they are ripe, placed upon the ground and covered to a greater or less depth with soil; the depth depending largely upon the amount of moisture. All seeds which have a porous covering, like the Elm, Ash, Maple, etc., should be sown in a carefully prepared seed-bed, immediately after they are gathered. Seeds which have a firm hard covering, like the Locust, retain their vitality for a long time, and may be kept in a cool, dry, equable temperature. Such seeds should be thoroughly soaked before being sown. In many sections of the country, seeds like the Walnut, Acorn, Hickory-nut, etc., can be successfully grown by planting them where the trees are to permanently stand, rendering transplanting unnecessary.

Preparation of Seed-bed. For nearly all hardy deciduous trees, any open ground is suitable, provided the soil be deep, mellow and rich. For evergreens, and a few deciduous trees like the Elm, the seed-bed must be shaded. In propagating forest trees, it is well to grow several varieties at the same time. Some insects, atmospheric trouble, or ill-understood condition of soil, may cause a failure of one or two varieties, where others live and thrive. If all should do well, when you come to transplant, those that are the most valuable may alone be used.

Transplanting of Seedling Trees. As a rule, this operation should be performed after the first season's growth. For some cases, if the season has been unfavorable, the variety a slow-growing sort, and the seedlings are not crowded, it may be better to leave them in the soil till another year.

Trees may be transplanted in the fall or spring; these are points that must be determined by the exercise of judgment. In Forestry, as elsewhere, nothing should be absolutely trusted but your own senses.

Hints for Planting and Cultivation.

(1.) Plant thickly in rows, with full purpose to thin and prune as circumstances shall dictate.

(2.) Never plant a tree that has any dead or diseased roots.

(3.) Upon a heavy clay soil, never plant seedlings any deeper than they were in the seed-bed. On a deep porous or drift soil, they should be planted several inches deeper.

(4.) Good cultivation is just as essential in a young Forestry plantation, as it is in a corn field.

Pruning Forest Trees. A straight stem is always desirable, and to secure this, some pruning is often necessary. Trees that are planted for ornament or for shelter, should usually be allowed to branch low. Those grown for timber, should be trimmed up, *i. e.*, all the lower branches should be removed. Care should be taken, however, not to carry pruning so far as to check growth. All suckers should be annually removed from the base of trees.

Choice of Varieties. The varieties most valuable for any given section, will depend upon location, and the demand in the nearest market. Locust, Catalpa, Chestnut, Soft Maple, Box-Elder, Cottonwood, Willow, etc., are varieties which will give the most speedy returns.

White Pine, Black Walnut, Butternut, Ash, Oak, etc., while not yielding so speedy returns, will prove in many sections the most profitable in the end."

The Rev. N. H. EGLESTON presented some of the results obtained by inquiries issued by the Department of Agriculture, showing the preferences of species in Dakota and Minnesota.

Remarks upon this subject, and upon the report last presented, were made by Messrs. BURSON, MINIER, G. W. WRIGHT and NORTHROP. Mr. MINIER presented some observations from his experience in the preservation and planting of seeds. He remarked that as a general rule, a seed should be placed in the soil to a depth equal to three times its length.

Mr. NORTHROP strongly deprecated the planting of large trees.

Mr. GEO. H. WRIGHT thought that Soft Maple seeds should be planted the same day that they were gathered.

Mr. BEADLE inquired concerning the planting of Black Walnuts, and particularly as to the necessity of their freezing. In the discussion that followed, Messrs. BURSON, BEADLE, MINIER, G. W. WRIGHT and LORING participated, the latter thinking that moisture had much to do with it.

Mr. J. G. KNAPP, then read a paper entitled, "*Effect of Climate on the Trees of Florida.*"

The following named persons having each been nominated by two members were duly elected, viz:

OLIVER GIBBS, jr., of Lake City, Minn.
JOSEPH S. SEWALL, of Saint Paul, Minn.
A. B. SAVAGE, of Saint Paul, Minn.
GEORGE P. PEFFER, of Pewaukee, Wis.
J. M. UNDERWOOD, of Lake City, Minn.

It was announced that the Excursion upon the Northern Pacific Railroad would start from the Union Depot at 8:30

A. M., on the day following, and that the tickets would be issued to Mandan, Dakota, and return.

A donation of cut flowers from Messrs. UNDERWOOD & EMERY, of Lake City, to each member of the Congress was then announced, and upon Motion of Mr. JOLY, a vote of thanks was returned.

The President having an engagement that would prevent further attendance, made brief remarks upon retiring, and the Congress adjourned until 7:30 P. M.

EVENING SESSION, Aug. 9.

The hour for meeting having arrived Mr. H. G. Joly, First Vice President assumed the chair, and Prof. A. LEUE, proceeded to read a paper entitled "*Forestal Exhibitions in Connection with Forestry Conventions.*"

Prof. B. G. NORTHROP, then addressed the Congress at some length, upon "*The Need of a Department of Forestry in Colleges.*"

This led to a discussion upon certain points suggested, in which Mr. THANE, Prof. BUDD and others participated.

Mr. G. W. MINIER then read a paper entitled "*On the Measurement of 22 Varieties of Forest Trees.*"

Discussison arose upon this paper in which remarks were made by Judge KNAPP, Prof. BUDD, and Judge HIGLEY.

Prof. WILLIAM SAUNDERS, then read a paper entitled "*Insects injurious to the White Pine.*"

A paper by GEO. R. STUNTZ, of Duluth was then read by Mr. J. FLETCHER WILLIAMS, entitled "*Did the Mound Builders Plant Trees.*"

A paper was read by Mr. ELIZUR WRIGHT, of Boston, Mass., entitled "*The Hygienic Value of Forests.*"

A paper written by Dr. A. EBY of Seebringville, Ont., and transmitted by him to the Recording Secretary was read by title, viz: "*How Shall we Manage our Natural Forests?*"

Prof. B. G. NORTHROP, offered a resolution recommending the appointment of an "Arbor Day" especially for the schools, in the several States, and in Canada, which was adopted.

Mr. STEWART THANE, then moved the following resolutions, which being seconded by Prof. Leue and discussed by various members were adopted, viz:

"Resolved, That it be an instruction to the Executive Committee of the American Forestry Congress, to call a meeting of enrolled members at the opening of next session *prior to any general meeting* to receive reports and communications, and to arrange the order of business.

"*Resolved*, That in the opinion of this Congress, it is advisable that some member of the Executive Committee, or some member or members deputed by them, shall proceed to the next place of meeting ten days prior to such meeting, to see that all necessary preparations be made for the reception of the Congress."

Upon motion of Mr. Williams, the acting Treasurer was authorized to pay the following bills:

To F. B. Hough,	(Expenses of Recording Sec.) -	$14.75
" B. E. Fernow,	(" " Cor. Sec.) - - -	2.75
" J. F. Williams,	(" " Acting Treas.) -	3.40

Votes of thanks were then passed as follows:

To the Governor of Minnesota for his kindness in granting the use of the Capitol for the meetings of the Congress, and for personal attentions:

To the Mayor of Saint Paul, and to the Members of the Local Committee for courtesies and attention to the affairs of the meeting:

To Mr. J. Fletcher Williams, in an especial manner for his constant and efficient services prior to and during the session:

To the "Burlington Cedar Rapids and Northern R. R. Co.;" the "Grand Trunk Railway Co.," of Canada, the "Chicago, Minneapolis and Omaha R. R. Co.," the "St. Paul and Milwaukee R. R. Co.," the "Chicago and Alton R. R. Co.," the "Michigan Central R. R. Co.," and the "Rock Island Railway Co.," for the kindness shown to the members of this Congress and for the concessions granted.

To the gentlemen of the press, who have attended and reported the proceedings of this session of the American Forestry Congress.

The meeting then adjourned to the call of the Executive Committee.

The following persons were registered, as attending the Saint Paul session of the American Forestry Congress:

Franklin B. Hough, Lowville, N. Y.; D. C. Burson, Topeka, Kan.; J. G. Knapp, Limona, Fla.; C. E. Bessey, Ames, Iowa; H. G. Joly, Quebec; Robt. W. Furnas, Brownville, Neb.; F. P. Baker, Topeka, Kan.; Geo. W. Minier, Minier, Ill.; John S. Hicks, Roslyn, N. Y.; Robt. B. Warder, North Bend, O.; Harmon Deam, Sidney, O.; Edward Daniels, St. Paul, Minn.; J. H. Morgan, Amherstburg, Ont.; Geo. B. Loring, Washington, D. C.; Wm. R. Lazenby, Columbus, O.; J. Fletcher Williams, St. Paul, Minn.; Warren Higley, Cincinnati, O.; J. B. Grinnell, Grinnell, Iowa; R. D. Jones, Des Moines, Iowa; B. G. Northrop, Clinton, Conn.; N. H. Egleston, Washington, D. C.; Elizur Wright, Boston, Mass.; Adolph Leué, Cincinnati, O.; N. S. Townshend, Columbus, O.; Stewart Thane, Ottawa, Ont.; Wm. Saunders, London, Ont.; J. L. Budd, Ames, Iowa; H. H. Young, St. Paul, Minn.; D. A. Robertson, St. Paul, Minn.; D. W. Beadle, St. Catharines, Ont.; Geo. P. Peffer, Pewaukee, Wis.; Suel Foster, Muscatine, Iowa; Oliver Gibbs, Jr., Lake City, Minn.; J. M. Underwood, Lake City, Minn.; Albert B. Savage, St. Paul, Minn.; G. W. Wright, Sioux City, Iowa.; and J. H. Bryant, St. Paul, Minn.—Total 37.

The Province Ontario was officially represented by Messrs. D. W. Beadle and William Saunders; and the Province of Quebec by Mr. Stewart Thane.

MISCELLANY.

Forestry in Manitoba.—The Canadian delegates to the American Forestry Congress, after the recent session at St. Paul, paid a visit to Manitoba. The Hon. H. G. Joly (ex-premier of Quebec), Mr. D. W. Beadle, President of the Ontario Fruit-Grower's Association, and Prof. William Saunders, President of the Entomological Society, accepted an invitation from the Council of the Board of Agriculture of that Province, to address a public meeting at Wesley Hall, in the city of Winnipeg, on the evening of August 17th; and at the close of the meeting an association was formed for the promotion of Horticulture and Forestry. We have not received an account of the proceedings, and are not therefore able to give its name or the names of its officers.

The White Oak.—At the last moment, before closing this number, we received an article from Prof. S. B. Buckley, Ph. D., of Austin, Texas, upon the White Oak. We can only summarize the principal points relating to its range, the dimensions to which it has been found growing, and some facts of greatest interest concerning it.

This species extends from near Lake Winnipeg and South-western Nova Scotia and New Brunswick, to Florida and Eastern Texas, and into Missouri and Arkansas. Prof. B. regards the variety of *Quercus alba* named "*Gunnisonii*," in vol. 2, p. 130, Pacific RR. Survey, growing on the eastern slopes of the Rocky Mountains, as probably the *Q. Durandii*, var. *San Sabea*, as described by him—a southern Oak growing in Texas, and so nearly resembling the White Oak that it is commonly called the "Bastard White-Oak." Prof. Watson's description, in the Botany of the 40th Parallel, agrees very well with the Texas Oak.

The White Oak has a greater range than any other American Oak except the *Q. rubra*. At Lake Winnipeg, according to Douglas, it is a small tree, about 20 feet high. In the Middle and Southern States it is large and majestic; nor does in diminish in size near its south-western boundary in Eastern Texas. The largest one seen was in North-western Louisiana, and measured 23 feet 7 inches around, and was apparently of the same size for fifty feet or more, to the first branches, and about one hundred feet high, with many large limbs symmetrically placed. Other species of the Oak may by larger, but Prof. B. had never seen one that had more wood by weight and measure than this tree, which was entirely sound and in vigorous growth, and adds "I walked eight miles to see it, and would cheerfully do so again." He mentions others in that State and in Texas, with a girth of 16 feet 9 inches and 15 feet 2 inches. Near the Mammoth Cave, Ky., he had measured one that was 17 feet 6 inches, and others of large size in the rich coves of the mountains in North Carolina, one of which measured 19 feet in circumference. In the Druid Park at Baltimore, and in Western New York, White Oaks are found of remarkable size.

He remarks that the wood of the White Oak is one of the most valuable known, for the frame-work of ships and buildings, and for carriages, agricultural implements and all wood-work where strength and durability are wanted. Young trees, growing apart from others, have the best and toughest wood, and deserve high rank in the list of trees for ornamental plantations. He recommends its more extensive planting, as well for ornament as use; but it would probably not do well on the western prairies, although we know that it thrives throughout all the region to the eastward.

No tree have been more celebrated in classic mythology than the Oak, and in prose and verse, in all countries that have a literature, ancient as well as modern.

It is remarked, in "Michaux's Sylva," that the White Oak every-where "shrinks from the sea breeze;" but Prof. B. had seen, in Flushing, near the western end of Long Island, trees measuring from 15 to 19 feet around, which appeared to disprove this belief, as to the unfavorable influence of the sea winds.

In the "American Sylva," of Michaux and Nuttall, vol. 4, p. 33, there is an account of "the largest Red Oak in North America," some miles from Nacogdoces, that measured 44 feet around, at two feet from the ground, and from 50 to 60 feet to the branches. In 1859, Prof. B. made a visit to the place, but the tree was dead and partly rotten. From a description obtained, he was led to think a mistake had been made in the species, and that the tree was the *Quercus falcata*, which is commonly known as the "Red Oak in Louisiana and west of the Mississippi River.

The Educational Aspect of the Forest Question.—It was noticed that among the papers read, and the subjects discussed, at the recent Forestry Congress, in St. Paul, the greater number incidentally, and several of them expressly, referred to the educational aspect of the Forestry of the future in America. In using the term "Education," we apply it in the broadest sense, as the making known of what was before unknown, as well through experiment as by direct instruction—but, in an especial manner, by impressing upon the young, in our schools and in families, some correct ideas of the importance of our woodlands, as well for the supplies that they furnish, as the advantages that they secure.

With this truth well learned, it follows, the person early taught, will naturally acquire habitual caution with respect to injuries that might follow a careless act, as in the use of fire without precaution, and that, when he comes to be the owner of land, he will exercise a thoughtful interest in the preservation and planting of timber trees in waste places, and wherever their shelter is most needed. He will not destroy a tree or a grove unless for some important use, and he will be willing to restore a woodland growth to his spent fields and worn-out pasture lands, and in this will have a thought as to the market value of the growth, by so managing the operatien as to secure the better kinds instead of allowing chance to bring in whatever happens to come up. If this education do nothing more than to unlearn the stubborn heresy of the pioneer settler, that trees are a nuisance to be abated, and teach, in its stead, that they are a blessing when growing in proper abundance and in the right places, it will have accomplished half its object. The other half, including a knowledge of how and where and what to plant, and how to manage, would come in by the observing of good examples, and by inquiry as to methods, from those who have obtained the best success.

It is to be noticed that in forest culture, as in agricultural and horticultural operations generally, there are no secrets. The man who has produced an excellent result, is naturally proud of it, and perfectly willing to tell his neighbors and his visitors the means by which he has obtained success. He may have an ambition for being mentioned as a model planter, and a thrifty and skillful manager, and would seldom or never give advice, but in the interest of improvement, and with a sincere desire of benefiting those who might ask it.

Botanical Gardens.—As an agency of popular education botanical gardens deserve a high rank, but in the United States and Canada they have scarcely received attention; and in this respect our cities and literary institutions suffer sadly in comparison with Europe, and even with many European colonies. In Java, Sumatra, Borneo, and Manilla, in various West India Islands, and in Australia, at Adelaide, Melbourne, Sidney, and Brisbane, there are gardens rich in botanical collections, and receiving accessions every year of plants that may be cultivated to advantage. In Europe, almost every city, and a large number of universities, may be justly proud of these collections, which serve the double purpose of pleasure and instruction.

Under proper regulations, these establishments become centers of influence, by the introduction of new species, and making known the opportunities for rural adornment that they afford. They present the means for settling many doubtful points in acclimatization, in the absence of regularly organized experimental stations; and their convenience in the prosecution of botanical studies, in connection with the herbaria and the libraries that should be established in connection with them, is of obvious utility.

It is to be hoped that this subject will ere long attract attention, especially at our colleges and universities. We believe that the Botanical Garden, at Harvard College, dates back for more than seventy years, and that it is still almost alone in affording the full means of instruction which this agency allows.

BIBLIOGRAPHICAL NOTICES.

The Organization and Valuation of Forests on the Continental System, in Theory and Practice. By J. L. MACGREGOR. London, 1883, pp. 313.

This volume is chiefly devoted to a discussion of the various questions involving mathematical principles in the estimation of forest values, as well in the management of cuttings, as in the computation of yield, with algebraic formulæ and tables for facilitating calculations. Although admirably adapted for use in countries where forests are treated upon a methodical plan, it is too early for application in regions where the native forests still supply the wants of man, and where the planted woodlands are as yet "few and far between." To those, however, who may wish to study the principles involved in the subject, this work will afford a concise and accurate idea of the manner in which these calculations are made, and will at least convince them that we have still a great deal to do, in bringing our woodlands to the condition where these principles may be applied.

The Forest Tree Planters' Manual. Published by the Minnesota State Forestry Assiciation, in accordance with an act of the Legislature, approved March 2nd, 1883. Third edition, Revised and Corrected. By Leonard B. Hodges. St. Paul, 1883, 8vo., pp. 116.

In the preface to this little volume, which was written about a month before the author's death, he informs us that the preceding edition had been exhausted for more than two years, and that hundreds of applications had, in the mean time, been received, asking for information upon special subjects connected with Forestry, which this little work would have supplied. The present edition has been carefully revised, and much new and valuable matter added.

The State Legislature has provided for the publication of this Manual, which is mailed free to any citizen of the State, upon application to the treasurer of the Association, Mr. J. Fletcher Williams, at St. Paul.

Die Eijenschaften und das forstliche Verhalten der wichtigeren in Deutschland vorkommenden Holzarten. Ein akademischer Leitfaden zum gebrauche bei Vorlesungen über Waldbau. Von Dr. Richard Hess. Berlin, 1883, pp. 163.

This work by Dr. Hess, Professor of Forestry in the University of Giessen, is devoted to a description of the trees of Germany, embracing 51 deciduous and 11 coniferous species. In addition to the botanical characteristics, it specifies the various conditions of soil, climate, and location preferred by each, the technical uses to which the timber is applied, and concise information as to cultivation and management. Under each title is given the various German names by which the species is known, with a list of synonyms under which it has been described by various botanical writers, and an enumeration of the varieties that have come under notice. This concise and admirably systematic summary of the principal trees of Germany, will be found useful to all who may desire information upon this subject, and presents a model that might be advantageously followed in other countries.

ANNOUNCEMENT.

The slender patronage of the American Journal of Forestry, amounting to considerably less than the cost of publication, requires its final suspension with the present number. To those who have expressed an interest in its continuance, and who have contributed to its pages, the Editor and Publishers return their acknowledgments.

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